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ERRATA

Page 12	line 25 for '581'		read '380'
22	3 ,, 'bunt'	,,	'loose smut'
	8 ,, 'bunt [*Tilletia caries* and *T. foetens*]'	,,	'loose smut [*Ustilago tritici*]'
28	17 ,, '109'	,,	'209'
29	30 ,, '*A. avenae*'	,,	'*U. avenae*'
30	18 and 20 for 'Weber'	,,	'Wehmer'
59	36 for '*herbarium*'	,,	'*herbarum*'
81	5 delete '*Ustilago penniseti*'		
109	14 insert 'Brien (R. M.) & Chamberlain (E. E.)' after 'Neill (J. C.)'		
167	17 for '*Blehnaria*'		read '*Blennoria*'
181	41 ,, 'xi'	,,	'x'
215	31 ,, '*todschlidowskii*'	,,	'*totschidlowskii*'
217	35 ,, 'became increasingly'	,,	'was'
226	1 ,, 'Hursch'	,,	'Hursh'
275	40 ,, 'Yamauti, Y.'	,,	'Yamauti, K.'
296	32 ,, '*alopercuri*'	,,	'*alopecuri*'
304	24 ,, 'Cotton-rot'	,,	'Cotton root-rot'
325	12 ,, '1934'	,,	'[1935]'
346	6 ,, '*Fusarium solani*'	,,	'*Fusarium solani* var. *martii* (= *F. martii*)'
348	36 ,, '*schedonardi*'	,,	'*schedonnardi*'
449	15 delete 'another . . . latter'		
457	32 for '*marionii*'	,,	'*marioni*'
462	16 ,, 'xiv'	,,	'xiii'
503	35 ,, '596'	,,	'496'
592	32 ,, 'xiii'	,,	'xiv'
617	7 ,, '*Mangina*'	,,	'*Manginia*'
669	14 ,, '*langsdorfii*'	,,	'*langsdorffii*'
670	49 ,, 'organisms'	,,	'cultures of *M. phaseoli*'
702	41 ,, '274'	,,	'374'
727	13 ,, 'walnut'	,,	'chestnut'
734	18 ,, '485'	,,	'385'
729	21 ,, 'xxvii'	,,	'xxxii'

IMPERIAL MYCOLOGICAL INSTITUTE

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KOVAČEVSKI (I. C.). Черното гниене по Кръстоцвѣтнитѣ в България, **Bacterium campestre (Pammel) E. F. Smith.** [The black rot of crucifers in Bulgaria, *Bacterium campestre* (Pammel) E. F. Smith.] —*Journ. Agric. Exper. Stations in Bulgaria*, Sofia, vi, 3–4, pp. 25–39, 1934. [English summary.]

This is a brief morphological, biological, and cultural account of *Bacterium campestre* [*Pseudomonas campestris*: *R.A.M.*, xiii, p. 610], which was recorded for the first time in Bulgaria in 1931, causing a black rot of cabbage, cauliflower, kohlrabi, and rape. Control measures are briefly discussed.

HIURA (M.) & KANEGAE (H.). **Studies on the downy mildews of cruciferous vegetables in Japan I.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 125–133, 1934.

It was shown by cross-inoculation experiments [the results of which are tabulated and briefly discussed] that the downy mildew (*Peronospora parasitica*) on radish does not attack cabbage (*Brassica oleracea* vars. *bullata* and *capitata*) and is only mildly parasitic on Chinese cabbage (*B. pekinensis*), *B. chinensis*, rape, and *B. juncea* [cf. *R.A.M.*, xii, p. 1]. Conversely, the form on *B. pekinensis* does not infect radish but is allied to one on *B. chinensis* and rape, the forms on *B. pekinensis*, *B. chinensis*, and rape being mutually infective to one another.

TOGASHI (K.) & SHIBASAKI (Y.). **Biometrical and biological studies of Albugo candida (Pers.) O. Kuntze in connection with its specialization.**—*Bull. Imper. Coll. of Agric. & Forestry* (Morioka, Japan), xviii, 88 pp., 1 fig., 6 graphs, 1934.

In continuation of their previous studies on the morphology of *Albugo candida* [*Cystopus candidus*], the agent of white rust of crucifers in Japan [*R.A.M.*, x, p. 556], the writers give a comprehensive, fully tabulated account of their biometrical examination of the conidia of the fungus from different hosts and of cross-inoculation experiments conducted with the various strains.

Two fairly distinct morphological forms were found to occur within the species, the name 'var. *macrospora*' being proposed to cover the strains parasitizing *Brassica* and *Raphanus* spp. and 'var. *microspora*'

for those on *Cardamine flexuosa*, *Capsella bursa-pastoris* var. *auriculata*, *Draba nemorosa* var. *hebecarpa*, and *Arabis hirsuta*. The conidia of the former group average 20 by 18 μ and those of the latter 15·5 by 14·5 μ. As a result of the cross-inoculation tests five well-marked biologic forms of the white rust were differentiated on (1) *C. bursa-pastoris* var. *auriculata*, (2) *D. nemorosa* var. *hebecarpa*, (3) *A. hirsuta*, (4) *R. sativus* var. *macropodus*, and (5) *B. cernua*, *B. chinensis*, *B. pekinensis*, and *B. rapa*.

Preston (N. C.). **The control of club root (finger and toe) in Cauliflowers.**—*Journ. Min. Agric.*, xli, 4, pp. 329–335, 2 pl., 1934.

In co-operative trials carried out at different centres in England and Wales in 1932 for the control of club root of cauliflowers (*Plasmodiophora brassicae*) in soils known to be heavily contaminated, mercuric chloride solution 1 in 2,000 [*R.A.M.*, xi, p. 17] was applied just before sowing at the rate of one pint to each 5 ft. of row under frames and at double this quantity in open seed-beds, followed by a second application of twice these amounts between the rows when the plants were 2 in. high; a third application was given before dibbling, ½ pint of the solution being applied to each hole before inserting the plants. In some of the tests only the first two treatments were given, and in others only the third.

The results obtained [which are tabulated and discussed] showed that the third treatment, if given to seedlings free from club root when planted out, in most cases gave crops over 70 per cent. of which were marketable. It is particularly suitable for areas where adequate rotation is difficult, but remains supplementary to the use of lime [ibid., xiii, p. 669]. Seed-bed infection can be controlled and a fair proportion of healthy seedlings raised by the two seed-bed treatments, but the need for the final treatment (when planting out) was clearly shown by some of the trials, in which from 84 to 100 per cent. of the plants treated only in the seed-bed clubbed heavily.

Crosier (W.). **Black spot of germinating Pea seed.**—*Phytopath.*, xxiv, 7, pp. 827–829, 1 fig., 1934.

For several years past, and especially in 1933, commercial samples of peas, beans [*Phaseolus vulgaris*], and Lima beans [*P. lunatus*] examined at the seed-testing laboratory, New York (Geneva) Agricultural Experiment Station, have shown an extensive dull olivaceous to sooty-black spotting, particularly apparent at a germination temperature of 25° C. The black areas, measuring 1 to 5 mm. in diameter and numbering from 1 to 100 (generally 3 to 10) on a single seed, are composed of a superficial growth of the long, pluriseptate, hyaline, dark brown, or black, irregularly branched hyphae, 4 to 16 μ in diameter, of a member of the Dematiaceae, probably *Dematium* [*Pullularia*] *pullulans* [*R.A.M.*, xiii, p. 523]. Short-ovate to cylindrical, hyaline spores, 6·5 to 12·5 by 3·5 to 6·3 μ, develop on short sterigmata from the hyphae when placed in water. Green peas collected direct from the pods with sterilized forceps showed no sign of fungal contamination which must occur, therefore, during the various operations (grading, bagging, and the like) subsequent to harvesting and threshing. Inoculation experiments with the fungus on various parts of a number of pea and bean varieties gave negative results.

Breazzano (A.). **Alcune osservazioni sulle decisioni prese dalla Riunione di esperti tenutasi in Berlino nel 1930 per la discussione dei metodi di analisi tossimetrica delle sostanze conservatrici del legno.** [Observations on the decisions reached at a meeting of experts held in Berlin in 1930 to discuss methods of toximetric analysis of wood preservatives.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiv, 2, pp. 185–201, 1934. [English summary.]

In this paper the author (who directs a wood-preservation laboratory of the Railway Section of the Royal Experimental Institute of Transport, Rome) compares the method used by him since 1910 in determining the fungicidal efficiency of wood preservatives with the wood block method with Kolle flasks recommended for general adoption at the international conference (at which Italy did not participate) in Berlin in 1930 [*R.A.M.*, x, p. 356].

Compliance with two conditions is essential: firstly, the results obtained must be based on the percentage concentration of the preserving fluid (determined by exact weight measurement) in the wood, not before injection, and secondly, the fluid must be distributed in the blocks as uniformly as possible. The 2 cm. thickness of the blocks generally used does not permit a uniform distribution of the fluid, the concentration of which in the block in relation to the weight of the latter is very different from that of the solution before injection. Sawdust might obviate this difficulty, but only if every particle contained an identical percentage of fluid; the necessary addition of water, however, disturbs the experimental conditions, while a further drawback is that the growth conditions of a fungus on sawdust being different from those on wood blocks the results may disagree.

Originally, the author advised the use of wood 1 mm. thick, but more recently he has used longitudinal pieces of veneer not more than 0·7 mm. thick placed in Roux tubes ('Breazzano's thin piece method'), an inoculation being considered to have given a positive result when the mycelium appears on the surface opposite that on which it was sown. Owing to the thinness of the test pieces the distribution of the fluid in them is as uniform as possible, and the results obtained are based on the concentration of the fluid in the wood. The fungus is placed on the treated wood, not the latter on a well-developed culture growing on agar in a Kolle flask, a method which the author considers to be inexact and the results of which he regards as unconvincing. In previous papers fully describing his method [see *Riv. Tecn. Ferrovie Ital.*, iv, 5, 1913, and *Rendic. nona Riun. Assoc. Ital. Studi sui Mater. da Costruz. tenuta in Torino* 19–22 *aprile 1922*] he stressed the necessity for taking precautions when removing a piece of mycelium from the culture not to bring away a fragment of the medium with it, otherwise a fungus which is supposed to be growing on a wood block may be deriving nutriment from its original medium. The numerous checks usually considered necessary to confirm the growth of a fungus on a wood block 2 cm. thick themselves indicate the unreliability of the method.

In other respects the author's technique closely agrees with that advocated in Berlin.

Imai (Y.). **Studies on the transmission of Broad Bean mosaic.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 241–245, 1934.

Broad bean [*Vicia faba*] mosaic was experimentally shown to be transmissible to broad beans by *Aphis rumicis*, *Macrosiphum pisi*, and *Myzus persicae* [*R.A.M.*, ix, p. 121 *et passim*]. The first-named insect conveyed infection from broad beans to garden and sweet peas, the second to sweet peas, and the third to garden peas. Infective aphids were able to transmit the disease to healthy broad beans after one day's feeding on a mosaic plant. The incubation period of the virus in the plant generally ranged from six to ten days, rarely up to three or four weeks. The progeny of viruliferous aphids, produced by parthenogenesis, failed to transmit mosaic.

In contradistinction to Böning [ibid., vii, p. 134], the writer obtained successful transmission of broad bean mosaic by needle inoculations with infected juice.

Persons (T. D.). **Preliminary report on an anthracnose of Lima Bean.**—Abs. in *Phytopath.*, xxiv, 7, p. 837, 1934.

Lima beans [*Phaseolus lunatus*] at Lyman, Mississippi, were attacked in 1932 by a fungus which seems to be a *Colletotrichum* and which causes reddish-brown, irregular lesions of variable extent on the pods. Numerous pink spore masses, surrounded by dark setae, were found in the diseased areas. The organism agrees well both with *Vermicularia polytricha* Cooke (*Grevillea*, xii, p. 24, 1883) and *C. caulicolum* Heald & Wolf (*Mycologia*, iii, p. 10, 1911), the spore measurements of which are given as 30 by 4 and 18 to 30 by 3·5 to 4 μ, respectively, while those of the Mississippi species are 21·6 to 28·8 by 3·6 μ. In nearly all cases the spores were more or less falcate. A description of a pod blight of Lima beans in North Carolina and Virginia by W. D. Moore (*Plant Disease Reporter*, xv, p. 113, [1931]) also agrees closely with the disease under observation.

Wellman (F. L.). **Identification of Celery virus 1, the cause of southern Celery mosaic.**—*Phytopath.*, xxiv, 7, pp. 695–725, 6 figs., 1934.

An extensive account is given of a new virus with a wide host range which causes a true mosaic of celery and is destructive also to cultivated cucurbits and sweet pepper (*Capsicum annuum*) in Florida and other parts of the United States [*R.A.M.*, xiii, p. 416]. It is transmissible by *Aphis gossypii* and artificial juice inoculations, filterable through a bacteria-excluding Berkefeld 'W' filter, destroyed by ten minutes' heating at 75° C. but not by 14 days' freezing, withstands dilution with water at ratios up to 1 in 100,000, and resists ageing *in vitro* for two days at 28° and for six to eight at 20°. The infective principle further resists desiccation on cloth for three to five days, being destroyed, however, within a day in crumbling infected cucumber foliage. It succumbs in fifteen minutes to 1 per cent. nitric acid, 50 per cent. hydrated lime solution, or 10 per cent. sodium chloride solution, but not to 50 per cent. ethyl alcohol. This virus, which the author names celery virus 1, was found to spread with considerably greater rapidity

within Turkish tobacco, *Nicotiana glutinosa*, and White Spine cucumbers than those of cucumber and tobacco mosaic and tobacco ring spot.

Although the symptoms of southern celery mosaic (the name applied by the writer to the disease induced by celery virus 1) show certain similarities to those of other well-known mosaics, there is considered to be no doubt that the virus concerned is new and distinct. The disturbances produced on celery by inoculation with the new virus were found not to correspond with those described on the same host by Poole [ibid., i, p. 440], Harvey (*Minnesota Agric. Exper. Stat. Bull.* 222, 1925), and Elmer [*R.A.M.*, iv, p. 755], which are believed to have been due to cucumber virus 1 [see next abstract].

Preliminary host range studies have shown that celery virus 1 is capable of infecting 23 species and varieties of plants in 8 families, including (besides those already mentioned) *Commelina nudiflora*, beet, broad bean (*Vicia faba*), cowpea, *Phacelia whitlavia* [cf. ibid., xiii, p. 601], tomato, *Datura stramonium*, *Physalis* spp., *Zinnia elegans*, *Tagetes patula*, and *Emilia sagittata*.

Price (W. C.). **Isolation and study of some yellow strains of Cucumber mosaic.**—*Phytopath.*, xxiv, 7, pp. 743–761, 6 figs., 1934.

On the basis of symptoms produced by inoculation experiments on Davis Perfect cucumbers, Bonny Best tomatoes, Henderson's Long Season spinach, Turkish tobacco, *Nicotiana glutinosa*, and *N. langsdorffii*, five strains of yellow viruses were differentiated as occurring in the bright yellow spots frequently observed in tobacco plants infected by R. H. Porter's cucumber mosaic virus ('white pickle mosaic virus' or 'cucumber virus 1'), a virus producing an ordinary green mosaic in cucumbers [*R.A.M.*, xi, p. 349; xii, p. 673]. Strain 1 is the least virulent, producing symptoms resembling those of Porter's virus on the differential hosts. The symptoms caused by strains 2 and 3 are similar to those of Porter's cucumber mosaic but the spotting is much more vivid. These two strains may be differentiated by their behaviour on *N. langsdorffii* and tomato, the symptoms of 3 being somewhat less severe than those of 2. Strain 4 is an attenuated form of 2 and 3, whereas 5 produces strikingly different symptoms consisting of systemic necrotic primary lesions in tomato, *N. glutinosa*, *N. langsdorffii*, tobacco, and spinach, and both yellow and necrotic primary lesions in cucumber. The lesions usually assume the form of solid spots or zonate rings but may occasionally follow the veins and produce oak-leaf patterns. This strain does not appear to be stable, giving rise to yellow mosaic in the systemically diseased leaves of several of the hosts studied. Some experiments were also carried out with E. M. Johnson's cucumber mosaic type 1 [ibid., x, p. 60], which produces symptoms on cucumber similar to those caused by Porter's virus 1 but can be differentiated from the latter by its effects on the other hosts mentioned above. By inoculation from tobacco leaves with yellow symptoms caused by infection with strain 5, a yellow and a green mosaic were separated in pure form, the evidence being that they arose in the plants infected with this strain. The former (strain 6) produces the most vivid spotting of any of the viruses here described, causing yellow primary lesions in all the above-mentioned hosts, of which tobacco, *N. glutinosa*, and spinach

occasionally develop complete chlorosis. It was experimentally ascertained that there is little difference between Porter's and Johnson's cucumber mosaic viruses and the newly described ones as regards their thermal death points and capacity to withstand ageing *in vitro*.

When Porter's cucumber mosaic virus 1 was passed in 10 serial transfers through the necrotic primary lesions that it produces in Black Eye cowpeas, in which there is little or no systemic spread, and subsequently inoculated into tobacco, it continued to produce in the latter bright yellow spots in addition to the usual green mottling. Similarly when Johnson's type 1 virus was passed through cowpeas it was still able to cause yellow spots on tobacco. When a mixture of a green (Porter's virus 1) and a yellow (strain 2) cucumber virus was used to infect cowpeas, most showed on transfer to tobacco only the presence of either the green or the yellow virus, though one cowpea plant spot had a mixture of both. This supports the conclusion that the yellow spotting caused on tobacco by green viruses after extended passage through local lesions on cowpea originated in some way (possibly by mutation) in the tobacco. In one case Johnson's virus after remaining as a green virus in cowpeas for 8 transfers produced some yellow spots on the 9th in addition to the necrotic local lesions, and subsequent transfers from the yellow spots continued to produce these and caused some systemic invasion and they also caused yellow mosaic on tobacco. In this case the yellow mutation appears to have arisen in the cowpea.

KENDRICK (J. B.). **Cucurbit mosaic transmitted by Muskmelon seed.**—*Phytopath.*, xxiv, 7, pp. 820–823, 1 fig., 1934.

In controlled experiments at Davis, California, with 23 packets of 12 commercial varieties of muskmelon, successful seed transmission of cucurbit mosaic [see preceding abstract] was obtained in 27 out of 11,519 plants (0·23 per cent.). The disease was subsequently transferred by artificial means from the mosaic Honey Dew seedlings to the Casaba, Hale's Best, Honey Ball, Honey Dew, and Tip Top muskmelon varieties and to the Early White Bush Scallop, Giant Summer Crookneck, and Italian squashes. In each case 100 per cent. infection was secured, the typical symptoms of the disease appearing in ten to twelve days.

YU (T. F.). **Pythium damping off of cucumber.**—*Agric. Sinica*, i, 3, pp. 91–106, 5 figs., 1934.

Pythium aphanidermatum [*R.A.M.*, xiii, p. 599] was observed in March, 1933 to be causing a severe damping-off of cucumbers in the hotbeds of the Nanking University garden [ibid., x, p. 776], some 80 per cent. of the plants being killed. The disease was subsequently found to be very prevalent in the neighbourhood.

The fungus was readily isolated on various standard media. The morphological characters, most conveniently studied in water cultures, are fully described [ibid., xiii, p. 399]. The zoospores, of which there are 8 to 50 in each vesicle, are reniform, biciliate, and measure 14 to 17 by 5 to 6 μ when in motion, 7·6 to 10·2 μ after coming to rest. The terminal, spherical, smooth oogonia measure 13 to 31·7 μ in diameter (average 23·8 μ), and the spherical, smooth oospores 13·6 to 24·2 μ

(18·7 μ). The lobate, intercalary antheridia measure 10·4 to 15·3 by 10·4 to 11·9 μ and generally occur singly, rarely two to an oogonium.

Positive results were given by inoculation experiments with *P. aphanidermatum* on *Benincasa hispida* [*B. cerifera*], melon, watermelon, *Cucurbita moschata*, cucumber, *Luffa cylindrica*, *Momordica balsamina*, *Lagenaria leucantha* [*L. vulgaris* Ser.], eggplant, chilli, and tomato [ibid., xiii, p. 124], causing fruit rot (and damping-off of cucumber); on cabbage (head rot); and on *Brassica chinensis*, radish, and tobacco (damping-off).

Good control of the disease was effected by the application to the soil of 1·5 or 2 per cent. acetic acid at the rate of 2 qt. per sq. ft. 9 to 13 days before sowing the seed.

SMITH (C. O.). **Stem-spot of Rhubarb.**—*Phytopath.*, xxiv, 7, pp. 832–833, 1 fig., 1934.

A preliminary note is given on a rhubarb disease that has become increasingly prevalent in California since 1914. It is characterized by oval to elliptical, reddish to reddish-brown spots, 1 to 15 by 1 to 3 mm., sometimes coalescent, on the stems, leaf blades, veins, and petioles, mostly of the first cuttings. From the petiole lesions a species of *Phyllosticta*, tentatively determined as *P. straminella* Bres. (cf. F. L. Stevens in *Illinois Agric. Exper. Stat. Bull.* 213, p. 299, 1919), was repeatedly isolated and inoculated into wounded and unwounded petioles with positive results.

CRAWFORD (R. F.). **The etiology and control of Chile wilt, produced by Fusarium annuum.**—*New Mexico Agric. Exper. Stat. Tech. Bull.* 223, 20 pp., 3 figs., 3 graphs, 1934.

The *Fusarium annuum* wilt of chilli peppers [*Capsicum annuum*] is stated to be the most serious disease of the crop in New Mexico [*R.A.M.*, xiii, p. 420]. Its first symptom is a more or less sudden wilt of the lower leaves, with a tendency to curl towards the midrib, the condition gradually spreading to the upper leaves. Death of the affected leaves and eventually of the whole plant may take place in a short time, depending on temperature, moisture, and methods of cultivation. Early outbreaks of the disease usually lead to the complete loss of the crop. Most commonly infection occurs at the base of the stem, wounds not being necessary for the entry of the fungus. Dark brown cankers are formed which gradually girdle the plant. The roots are also attacked, becoming soft and water-soaked. The wilting and death of the diseased plants is not caused by a mechanical plugging of the xylem but by the breaking down and disintegration of the invaded tissues. Experiments showed that the wilt is not seed-borne, and that *F. annuum* can live in the soil indefinitely; it is spread in the fields with loose soil during sand storms, and also by irrigation water. The species concerned belongs to the *Martiella* section, and possesses usually continuous microconidia, chiefly three-septate macroconidia (although five-septate ones are not uncommon), and mostly non-septate chlamydospores borne singly, in chains, or in clusters.

In pure culture the fungus grows most rapidly at temperatures from 23° to 31°, with an optimum at about 27° C.; its growth appeared to be

retarded by any considerable fluctuations in temperature. Field observations indicated that the wilt is most serious in low, wet fields, or where the crop is grown on heavy, undrained soils. The paper terminates with a brief account of field tests to determine the effect of different cultural practices on the incidence and severity of the wilt, a full report of which has been noticed from another source [loc. cit.].

TERUI (M.). **On the occurrence of the wilt disease of Sesame in Japan.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 225–226, 1934.

In 1932 sesame plants at the Hokkaido Imperial University, Sapporo, were attacked by a wilt disease, characterized by wrinkling, drooping, and blackish-brown discoloration of the leaves (the last-named symptom also affecting the stems and roots), and by the eventual death of the plants. The causal organism was readily isolated on a number of standard media, making the best growth at about 30° C., and was inoculated into sesame plants with positive results. It produced branched conidiophores bearing a head of mostly non-septate, ovoid to ellipsoid, hyaline microconidia, 5 to 23·5 by 2·5 to 5·5 μ, and also formed lunulate, cinnamon buff-coloured macroconidia, 3-, 4-, or 5-septate, measuring 20·8 to 44·2 by 2·6 to 4·5 μ, 36·4 to 49·4 by 3 to 5 μ, and 41·6 to 52 by 4 to 5 μ, respectively. Apical or intercalary chlamydospores were produced. These characters are considered to agree with those of *Fusarium vasinfectum*, with which the fungus is accordingly identified [*R.A.M.*, v, p. 767; vi, p. 123].

PETRI (L.). **Sull'arricciamento (court-noué) della Vite.** [On leaf roll (court-noué) of the Vine.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiv, 2, pp. 273–278, 1934. [English summary.]

After referring to his earlier papers on vine court-noué, in which he expressed the opinion in 1929 [*R.A.M.*, ix, p. 83] that the condition belongs to the virus group of diseases and pointed out that the best diagnostic symptom is the presence of intracellular cordons in the wood [cf. ibid., xii, p. 419], the author states that in the latest edition of Sorauer's Handbook of Plant Diseases [ibid., xiii, p. 646] the disease is included in the virus group, but no reference is made to his papers on the subject, the view that it is due to a virus being wrongly assigned to the French phytopathologists. Its attribution by Viala and Marsais to the fungus *Pumilus medullae* [ibid., xiii, p. 680] may be due to a confusion between this disease and the numerous forms of 'rachitism' to which the vine is subject, while Ranghiano's endophytic mycelium [ibid., xiii, p. 616] is not considered to have been conclusively demonstrated.

A bibliography of 12 titles is appended.

DE CASTELLA (F.). **Court-noué—a mysterious Vine disease.**—*Journ. Dept. Agric., Victoria*, xxxii, 6, pp. 298–301, 1934.

In discussing the various theories that have been put forward as to the real nature of court-noué of the vine and in drawing attention, in particular, to the recent paper by Viala and Marsais attributing the majority of cases to the fungus *Pumilus medullae* [see preceding

abstract], the author states that the disease is not uncommon in some parts of Australia, where, however, recovery is more frequent than in Europe.

Bentley (S.). **Powdery mildew of the Vine.**—*Gard. Chron.*, xcv, 2477, pp. 409–410, 1 fig., 1934.

In connexion with a recent official publication (*Min. of Agric. Advisory Leaflet* 207) concerning the occurrence of powdery mildew of the vine [*Uncinula necator*] in England [see next abstract], the writer describes the results of experiments in the control of this disease on the St. Emilion, Frontignan, and Cepages Rouges varieties in Charente Inférieure, France, in 1932–3 [cf. *R.A.M.*, xiii, p. 745]. In the former season the outcome of preliminary trials with shirlan HB and a small quantity of agral I for wetting and spreading [ibid., xii, p. 403; xiii, p. 10] were so satisfactory that tests on a larger scale were conducted in the following year with shirlan AG (in which agral is incorporated) at the rates of 6, 10, and 13 oz. per 10 galls. water. The disease was effectively combated at all the concentrations used in the case of mild attacks, but where infection was more severe it was necessary to employ the preparation at maximum strength. Shirlan tends to collect in a white deposit at the base of the fruits, the rest of which is covered with a thin film, quite harmless to the grapes and comparing favourably with the heavy coating left by Bordeaux mixture. Early application is very important.

Durham (H. E.). **Powdery mildew of Vines under glass.**—*Gard. Chron.*, xcvi, 2480, p. 13, 1934.

The writer's attempts to control powdery mildew [*Uncinula necator*] on three 60-year-old glasshouse vines in England by three applications of shirlan AG [see preceding abstract] were quite unsuccessful. Both in fungicidal and adhesive properties the preparation was found to compare unfavourably with 1 per cent. lysol [*R.A.M.*, xi, p. 493]. The results on apple foliage attacked by mildew (*Sphaerotheca*) [?*Podosphaera leucotricha*] and on tomato leaves infected by *Cladosporium* [*fulvum*] were equally poor, but a considerable improvement was effected in the condition of vegetable marrows suffering from a white mildew [?*Erysiphe cichoracearum*]. Hitherto the best control of *U. necator* on the vines has been given by the tasteless, non-poisonous drug chinosol [quinosol: ibid., xiii, p. 792] which is scarcely practicable, however, for use on a commercial scale.

Oltarjevski (N. P.). Исследование инкубационных периодов мильдью Винограда в условиях континентального климата и их значение в профилактике. [Study of the incubation periods of the Vine mildew under continental climatic conditions, and their significance in prophylaxis.]—*Acta Inst. Bot. Acad. Scient. U.R.P.S.S.*, Ser. iv (*Bot. Experimentalis*), Leningrad, *1934*, 1, pp. 223–234, 4 figs., 2 graphs, 1934. [German summary.]

Field observations in 1930 in the Caspian area and the Caucasus, where the climate is of an essentially continental type, with night temperature minima frequently fluctuating between 6° and 0·5° C. as

late as the end of June while the diurnal (24 hours) mean temperature varies between 18° and 20° or even higher (temperature records being taken at 7 a.m., 1 p.m., and 9 p.m.), showed that spring outbreaks of vine mildew (*Plasmopara viticola*) only occur after periods of three or four days during which the night minimum does not sink below 13° to 10°, all other meteorological conditions being in favour of the development of the disease [cf. *R.A.M.*, xiii, p. 561]. In certain localities strong winds during the night and early morning were also found to be a limiting factor in the development of the outbreaks, presumably in consequence of their desiccating action on the moisture present on the leaves [ibid., xiii, p. 678]. These observations, supported by the results of a small range of controlled experiments [details of which are given], are considered to support the author's view [ibid., xi, p. 93] that Müller's incubation curve [ibid., x, p. 432] is not applicable under all sets of climatic conditions, and should be corrected to suit the local conditions prevalent in different regions.

Further observations in 1930 indicated that sprinkling the vineyards with 1 per cent. Bordeaux mixture 1 to $1\frac{1}{2}$ months prior to the outbreak of the primary infection (from the winter spores) did not check the development of the disease. Owing to shortage of copper sulphate in Russia, experiments were made to find an effective substitute for it in the control of the mildew, including barium, calcium, and sodium polysulphides; barium polysulphide was slightly effective when applied at the time of highest susceptibility of the fungus to treatment, but the other two polysulphides not only did not give control but appeared to stimulate the fungus; all three preparations scorched the vine foliage rather severely, and significantly reduced the sugar content and increased the acidity of the resulting crop, as compared to that from vines sprayed with Bordeaux mixture. A small range of tests indicated that 1 per cent. soap emulsion gave a measure of control of *P. viticola*, the chief drawback of this preparation being the ease with which it is washed off by rain and dew; the addition of inert substances to the emulsion only slightly increased its adhesivity, and had the disadvantage of seriously clogging the nozzles of the spraying guns.

Young (V. H.). **Observations on the control of black rot of Grapes.**—Abs. in *Phytopath.*, xxiv, 7, pp. 841–842, 1934.

Black rot (*Guignardia bidwellii*), the most serious disease of Concord grapes in north-west Arkansas, may be adequately controlled by the application, just before and directly after blooming and 10 to 14 days later, of 4–4–50 Bordeaux mixture [cf. *R.A.M.*, x, p. 75]. No additional benefit was derived in five years' experiments by extra pre- and post-blossom sprays.

In May 1930 numerous black rot cankers were found at the base of suckers arising at or below soil level subsequent to extensive killing back of the vines by severe midwinter frosts. The cankers were covered with pycnidia containing mature spores, which had evidently developed from conidia or ascospores washed on to the young sprouts from the previous year's mummies lying on the ground. The diseased tissues were rapidly isolated by a corky layer and had almost disappeared by mid-season.

Hengl (F.) & Arthold (M.). **Die Stielfäule der Trauben und ihre Bekämpfung. Ergebnisse der im Jahre 1932 durchgeführten Versuche.** [The stalk rot of Grapes and its control. Results of the experiments conducted in the year 1932.]—*Die Landwirtsch.*, Vienna, pp. 187–188, 1933. [Abs. in *Bot. Centralbl.*, N.F., xxv, 1–2, pp. 54–55, 1934.]

The best control of stalk rot of grapes [*Botrytis cinerea*: *R.A.M.*, xi, p. 495] in a Lower Austrian vineyard was obtained in 1932 by two applications in July of Bordeaux mixture and cotton-seed oil soap [cf. ibid., xi, p. 253; xiii, p. 779], the latter being used at the rate of 200 gm. per 100 l. of the mixture.

Gigante (R.). **Fenditure di origine non parassitaria nei tralci della Vite.** [Cracks of non-parasitic origin in Vine branches.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiv, 2, pp. 211–222, 8 figs., 1934. [English summary.]

Green vine branches examined by the author showed dark longitudinal cracks ranging in length from a few millimetres to the length of the internode and occasionally including the node. The tissues were split along the medullary rays, the sides of the crack being composed of a layer of deformed cells with lacerated walls, overlying a few layers of necrosed cells; the latter were separated from the healthy parenchyma by a cork layer. In the deeper cracks the walls were composed of a superficial layer of necrosed cells, with callus originating in the cambium and medullary rays underneath. Where the medulla itself was cracked the walls of the crack became covered with callus and were quickly cut off from the unaffected part by a cork layer, while owing to tensions and contractions set up in the growing branch two secondary cracks occurred perpendicularly to the main one along a line separating the medulla from the central cylinder. The new tissues contained no lignified elements. The xylem of the primary vascular bundles situated laterally to the medullary ray along which the crack extended was discoloured and the space between the bundles filled with a parenchymatous tissue.

No parasitic organism was present and the cracks are attributed to the exceptional turgidity of the branches resulting from the absorption by the vines of abnormal amounts of water during very rainy, humid weather. The branch tissues not increasing in turgidity uniformly, abnormal tensions, aggravated by the different growing rates of the various tissues, were set up. This unequal tension produced laceration and rupture of the less resistant tissues of the medullary rays.

Van Poeteren (N.). **Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1933.** [Report on the activities of the Phytopathological Service in the year 1933.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 76, 117 pp., 3 pl., 1934.

Among the numerous interesting items in this report, prepared on the usual lines [*R.A.M.*, xiii, p. 10], the following may be mentioned. For the first time in the history of the Dutch phytopathological service reports were received of heavy damage to the maize crops from *Ustilago maydis* [*U. zeae*].

An uncommon disease of pears was caused by a species of *Coniothyrium*, producing brown spots on the foliage and fruit. Infection is believed to have been favoured by the cold, damp spring and dry, hot summer. The same host was attacked by the so-called Pacific coast canker due to *Neofabraea malicorticis*, not hitherto reported in Holland but fairly prevalent in North America [ibid., xii, p. 299]. *Diplosporium album*, previously known only as a saprophyte, was isolated from St. Remy pears suffering from an extensive die-back of the branches, which may have been primarily due either to adverse environmental conditions or to the parasitic activity of the fungus.

Strawberries were affected by root rot and dwarfing of the aerial organs caused by a species of *Coniothyrium*, probably *C. fuckelii* [*Leptosphaeria coniothyrium*: ibid., xi, p. 767; xiii, pp. 637, 703], of which this is the first record on the strawberry in Holland.

Raspberry canes showed a yellowish-grey discoloration of the wood underlying the buds due to *Pyrenochaeta briardi* Hariot, the black pycnidia of which were visible to the naked eye on the affected areas. The fungus is stated to occur on *Rubus* sp. in the south of France, but this is the first record of its development on raspberry canes in Holland.

Urocystis colchici [ibid., iv, p. 210] was found infecting bulbs of *Colchicum bornmülleri*; other hosts of this smut are *C. autumnale* and *C. orientale*. *Crocus* (*C. zonatus*, *C. purpurea grandiflora*, and Enchantress) bulbs were submitted for the first time bearing lesions exactly corresponding with those caused on *Gladiolus* corms by *Septoria gladioli* [ibid., xiii, p. 581], and isolations yielded a fungus resembling *Septoria* in mycelial characters though no fructifications developed. The 'ink-spot disease' of *Iris reticulata* due to *Mystrosporium adustum* [ibid., x, p. 462] was also recorded for the first time in the country. Leeuwenbek *Antirrhinum* plants from Hilversum showed a leaf infection apparently caused by *Puccinia antirrhini* [ibid., xiii, p. 771], this being another new record for Holland.

The pycnidial stage (*Fusicoccum noxium*) of *Dothidea* (*Plowrightia*) *noxia* [ibid., viii, p. 347] was found to be responsible for an apical die-back of young beech twigs at Amersfoort.

In 1931 *Ophiobolus graminis* was found to be the cause of 'brown patch' on grass plots. During 1933 complaints of a similar condition were received from various quarters, e.g., Hilversum, where *Sclerospora graminicola* [ibid., xiii, p. 436], rarely or never before observed in Holland, was shown to be responsible for the injury. None of the common agents of the disorder was found among the grass samples from golf greens examined in 1933, with the exception of isolated *Rhizoctonia* hyphae [cf. ibid., xii, p. 781], but the roots contained spores of *Asterocystis radicis* and *Ligniera* sp. The former organism appeared to be as innocuous to the grasses as it has been shown to be to flax, of which it was long suspected to cause the 'fire' disease [ibid., vii, p. 578]. *L.* sp. is commonly encountered in the roots of beets affected by yellowing [ibid., xiii, p. 611], but its pathogenicity has not been demonstrated and for the present it must also be regarded as harmless to the grasses. A species of *Alternaria*, characterized by a greyish mycelium, was isolated from the decaying stems and may possibly be implicated in the causation of the trouble.

Notes are given on the potato blight [*Phytophthora infestans*] spray-warning service [ibid., xi, p. 123], the determination of the dates of initial infection by the apple and pear scab fungi [*Venturia inaequalis* and *V. pirina*], and the testing of various fungicides.

STELL (F.). **Report of Mycologist, 1933.**—*Admin. Rept. Dept. Agric. Trinidad and Tobago for the year 1933*, pp. 43–45, 1934.

During the period under review cacao witches' broom (*Marasmius perniciosus*) [*R.A.M.*, xiii, pp. 288, 359] continued to spread in Trinidad, a few very slight, sporadic centres of infection occurring in the Northern Range. As in other countries, infection is heaviest in low-lying districts where humidity and rainfall are highest. On the Government Cacao Estate in the Manzanilla area, where the disease is fairly severe, effective control has resulted from a monthly destruction of infected material, this method having reduced the losses of mature pods to under 1 per cent. [ibid., xiii, p. 289]. In an endeavour to select highly resistant or immune trees, monthly checks of the incidence of infection are being made on a very large number of observation plots in different localities, including those where the disease was first recorded in the island.

Messrs. Trinidad Leaseholds have put on the market a gas oil which is being successfully used to kill banana plants infected with Panama disease (*Fusarium* [*oxysporum*] *cubense*) [ibid., xiii, p. 112]. Two to four pints per stool are required, according to size; the plant and suckers are cut down to a few inches above soil level and the trash and weeds carefully removed to enable the oil to reach the underground parts and soil. The oil is then applied to the stool and the surrounding soil in such a way that the greater part reaches the soil immediately touching the outside of the plant and suckers, penetrating to the underground buds and killing the eyes. The aerial parts of the diseased stools are cut up and either burnt or sprinkled with oil.

Pennisetum purpureum, which is grown in many parts of Trinidad as fodder, was so severely infected by a *Helminthosporium* on one estate that practically nothing remained to cut; small outbreaks occurred in other localities, infection being most prevalent during the early months of the year, when temperatures are lowest.

WALLACE (G. B.). **Report on a survey of plant diseases in the Iringa Province in June, 1934.**—*Tanganyika Dept. of Agric. Mycol. Leaflet* 16, 15 pp., 1934.

Notes are given on a number of familiar diseases of economic crops encountered during a phytopathological inspection of the Iringa Province, Tanganyika Territory in June 1934, and also on an apparently new disease of coffee, tea, *Eucalyptus* spp., *Grevillea robusta*, tree tomato [*Cyphomandra betacea*], loquat, castor [*Ricinus communis*], *Cassia floribunda*, *Cinnamomum camphora*, rose, and other plants caused by a species of (?) *Stilbum*. Coffee leaves attacked by the fungus develop roughly spherical, putty-coloured, water-soaked, more or less conspicuously zonate lesions, covering up to half the surface, on which are formed dark, erect synnemata about 3 mm. long. The coffee cherries [fruits] bear similar spots of a greyish-green colour. The disease is accompanied by heavy defoliation and cherry fall in coffee and by

moderately severe loss of older leaves in tea, on which and on the other hosts of the fungus the symptoms are similar to the foregoing. The *Stilbum* disease is rife during the cold wet period from April to June or later; in all probability the causal organism originates in the jungle, where it can persist throughout the year. Infection is also favoured by heavy shelter, and control measures should be based on the amelioration of environmental conditions supplemented by the application in March of 2 per cent. Bordeaux mixture plus alum at the rate of 6 oz. per 16 galls.

LEACH (R.). **Report of the Mycologist for 1933.**—*Ann. Rept. Dept. of Agric., Nyasaland, 1933*, pp. 54–55, 1934.

Tea in Nyasaland is on the whole free from disease, the only fungus likely to prove extensively troublesome being *Armillaria* [*mellea*: *R.A.M.*, xiii, p. 216], which continues to cause damage on some estates. The rhizomorphs of this fungus were found growing plentifully from the dead roots of *Cajanus indicus* plants killed by it in a patch of badly affected tea in Mlanje and less profusely on dead tea plants in Cholo. The available evidence indicates that the spread of the disease in Nyasaland is primarily associated with the presence of the fungus in the dead roots of cleared forest trees; the removal of diseased roots would not give effective control if isolated, unattached rhizomorphs were capable of continuing infection of the replanted tea. Among the indigenous forest trees that are most likely to pass the disease on to tea is undoubtedly *Parinarium mobola* [ibid., xiii, p. 425].

A fruit spot and stem canker of mangoes, at first considered to be of fungal or bacterial origin but later attributed to insect attack, is being investigated.

AUCHINLECK (G.). **Report on the Department of Agriculture, Gold Coast, for the year 1933–34.**—18 pp., 1934.

After referring to the fact that since 1st October 1933 consignments of cacao beans for the United States must not contain over 5 per cent. mould or 10 per cent. combined mould and worm infection [*R.A.M.*, xi, p. 416], the author states that of the 1932–3 Gold Coast cacao crop 54,300 tons or just over one-fifth was below this standard, as was also the case in previous years [ibid., xii, p. 149].

Coco-yam [*Xanthosoma sagittifolium* and *Colocasia antiquorum*] root rot [ibid., xi, p. 763] was ascertained to be due to *Rhizoctonia* [*Corticium*] *solani* attacking roots growing in unfavourable soil.

Bananas were occasionally attacked by *Marasmius* disease [*M. stenophyllus*: ibid., xi, p. 97], causing collapse of the pseudostem.

MARCHIONATTO (J. B.). **Notas de patologia vegetal. Contribución al conocimiento de las enfermedades de las plantas provocadas por los hongos.** [Notes on plant pathology. A contribution to the knowledge of the plant diseases induced by fungi.]—*Rev. Fac. Agron. Univ. Nac. La Plata*, xix, 3, pp. 407–426, 12 figs., 1933. [Received October, 1934.]

Notes are given on some fungous diseases of cultivated plants observed

for the first time during the last few years in the Argentine Republic. They include *Colletotrichum gloeosporioides*, long present in orange and lemon plantations, but first detected in 1929 on kumquat (*Fortunella margarita*) in Corrientes and Tucumán; *Gloeosporium nervisequum* on plane (*Platanus occidentalis*) trees in the environs of Buenos Aires and La Plata [*R.A.M.*, xii, p. 735]; *Fusarium moniliforme* var. *subglutinans* [ibid., xiii, p. 510] producing a reddening of the caryopses of San Martin wheat; *Rhynchosporium secalis* causing scald of barley [ibid., xii, p. 676]; *Heterosporium avenae* [ibid., iv, p. 536] on oats; *Botrytis paeoniae* [ibid., ix, p. 785] on peonies (*Paeonia albiflora*), causing much damage in nurseries near Buenos Aires; *Rhizoctonia* [*Corticium*] *solani* on sugar beets; and *Mycosphaerella pinodes* and *Ascochyta pisi* [ibid., xiii, p. 612] on peas, the former producing perithecia on the leaves and stalks.

Poplars (*Populus balsamifera*) at Córdoba in 1928 bore spherical, yellow, purple-bordered cankers, 5 to 20 mm. in diameter, on the branches, strewn with the sub-epidermal, dark-coloured, coriaceous, globose pycnidia of *Dothiorella gregaria* [ibid., vii, p. 621], which arise singly or in groups from a basal stroma. The hyaline, fusoid straight or slightly curved pycnospores, truncated at both ends, measure 30 by 5 μ. Sporadic infection of *P. nigra* var. *italica* by *Septoria populi* [ibid., xi, p. 329] has been observed in the Paraná Delta islands.

The pale, scutiform lesions observed on peach branches in the Buenos Aires province and the Paraná Delta islands in 1930 are attributed to *Phoma persicae* [ibid., xi, p. 268] on the basis of the spore measurements and their allantoid shape. Associated with the abnormally cold, wet weather of the same year was a widespread die-back of peach trees caused by a species of *Cytospora* with stromatic pycnidia, 100 to 105 μ in diameter, and rod-shaped, curved, hyaline pycnospores (3 to 4 by 1 μ), tapering at both ends (probably *C. candida* Speg.), the ascigerous stage of which (*Valsa leucostoma*) [*Leucostoma persoonii*: ibid., xi, p. 60] was detected on the same host in 1927.

Vermicularia [*Colletotrichum*] *capsici* [ibid., xi, p. 545] was isolated in 1931 from chilli fruits collected at San Isidro, Buenos Aires, affected by a die-back first observed at Guatraché, La Pampa, in 1926. *Gloeosporium piperatum* (the imperfect stage of *Glomerella cingulata*) [ibid., xi, p. 803] is a common local agent of chilli fruit rot, but no genetic connexion could be traced between it and *C. capsici*.

Diaporthe citri [ibid., xiii, p. 763] developed readily in culture from the mycelium of *Phomopsis citri*, isolated from oranges in Corrientes (1928) and E. Ríos (mandarins) and in 1931 from the same host in Montevideo (Uruguay). Mandarins in E. Ríos were attacked in 1929 by a highly destructive stem-end rot associated with *Alternaria* and *Cladosporium* spp.

A species of *Coniothyrium* characterized by depressed-globose, carbonaceous pycnidia, 160 to 170 μ in diameter, containing continuous, dark-coloured, ellipsoidal pycnospores (3 by 2 μ), has been found on roses causing symptoms resembling those induced by *Coniothyrium fuckelii* (*Leptosphaeria coniothyrium*) [see above, p. 12], in other countries.

Clara (F. M.). **A comparative study of the green-fluorescent bacterial plant pathogens.**—*Cornell Agric. Exper. Stat. Memoir* 159, 36 pp., 5 pl., 1934.

After mentioning that the number of species hitherto described in the green-fluorescent group of phytopathogenic bacteria is forty, the writer gives a comprehensive account of his studies of 19 species and 2 varieties (27 isolations) belonging to this group. They were *Phytomonas angulata* [*Bacterium angulatum*] from Virginia tobacco, *P. apii* [*Bacterium jaggeri* (Stapp) Elliott] from celery, *P.* [*Pseudomonas*] *cerasi* from sweet cherry [*R.A.M.*, xiii, p. 642], *Phytomonas* [*Pseudomonas*] *endiviae* from endive [ibid., ix, p. 503], *Phytomonas* [*Bact.*] *holci* from maize [ibid., xii, p. 165], *P.* [*Bact.*] *lacrymans* from cucumber [ibid., xiii, p. 419], *P. marginalis* [*Bact. marginale*] from lettuce [ibid., xii, p. 677], *P.* [*Bact.*] *medicaginis* var. *phaseolicola* from bean (*Phaseolus vulgaris*) and kudzu vine (*Pueraria hirsuta*) [ibid., x, p. 5], *Phytomonas polycolor* from Philippine tobacco [ibid., x, p. 133], *P.* [*Pseudomonas*] *syringae* from lilac [ibid., xiii, p. 288], *Phytomonas* [*Bact.*] *trifoliorum* from clover (*Trifolium repens*) [ibid., viii, p. 176], *P.* [*Pseudomonas*] *utiformica* from pear [ibid., xii, p. 376], *Phytomonas* [*Bact.*] *vignae* from Lima bean (*Phaseolus lunatus*) [ibid., xii, p. 2], *Phytomonas* [*Bact.*] *vignae* var. *leguminophila* from bean, *P. viridiflava* [*Bact. viridiflavum*] from bean [ibid., xii, p. 71], *P. viridilivida* [*Bact. viridilividum*] from lettuce [ibid., vi, p. 263; ix, p. 224], *Pseudomonas aeruginosa* (*Bacillus pyocyaneus*) [ibid., iv, pp. 184, 252, 368, 470], *P.* [*B.*] *fluorescens* [ibid., xii, p. 448], and *P. putrida* [*B. f. putridus*] from decaying storksbill [*Erodium cicutarium*] leaves.

The green-fluorescent character of this group of pathogens was consistently reproduced in Uschinsky's solution and Sullivan's basal asparagin solution (*Journ. Med. Res.*, xiv, p. 109, 1905). Seventeen plants were used in the cross-inoculation experiments, as a result of which the organisms may be placed in two groups according to their narrow or wide range of hosts [shown in tabular form]. The former group includes *Bact. medicaginis* var. *phaseolicola*, *Bact. jaggeri*, *Bact. lacrymans*, *Bact. angulatum*, *Bact. marginale*, *Bact. viridilividum*, and *Phytomonas polycolor*, all of which appear to be pathogenically distinct, while the latter comprises *Pseudomonas syringae*, *Bact. vignae* and its var. *leguminophila*, *Bact. viridiflavum*, *P. cerasi*, *Bact. trifoliorum*, *Bact. holci*, and *P. endiviae*, among which close biological relationship and possibly in some cases even identity is indicated. Many of the pathogens under observation are stated to be reported for the first time on the plants used in the tests. Of interest in this connexion is the capacity of *Bact. viridiflavum* and *P. endiviae* to infect *Delphinium*. Most of the definitely phytopathogenic organisms were characterized by their ability to ferment sucrose, a property that was lacking in the weak pathogens or in the bacteria innocuous to plants. It is proposed that *Bact. vignae* and its var. *leguminophila* should be considered as synonyms of *Bact. syringae*, while the definition of *P. cerasi* should be extended to include *Bact. trifoliorum* and *Bact. holci*. *B. fluorescens* may be regarded, by reason of its physiological characters and mild pathogenicity to Kieffer pears, as a transitional form between the plant pathogens and the non-phytopathogenic organisms of the green-fluorescent group.

Christoff (A.). Приносъ къмъ терапията на бактериалния ракъ при растенията. [Contribution to the therapeutics of crown gall.]—*Journ. Agric. Exper. Stations in Bulgaria*, Sofia, vi, 1–2, pp. 17–30, 2 figs., 1934. [English summary.]

Details are given of experiments, the results of which showed that primary and secondary tumours, artificially induced by inoculations of *Bacterium tumefaciens* into tomato and sunflower stems, were successfully destroyed, without undue injury to the hosts, by local application of radiated heat (52° to 55° C.) for 5 to 10 minutes, by plunging one electrode from a low tension dry battery into the tumour and touching the surface of the tumour with the other electrode, and finally, by introducing into the tumour tissues the vapour of osmic acid from crystals contained in a small glass ampulla terminating in a capillary tube, the end of which is plunged into the tumour and left in it until the appearance of the first faint symptoms of degeneration of the tumour. In a small range of experiments, the tumours were also killed by introducing into them one or two drops of a 2 per cent. solution of osmic acid, the treatment not interfering with the general health of the hosts.

Park (M.). **Further notes on Cacao disease in the Dumbara Valley, 1933.**—*Trop. Agriculturist*, lxxxiii, 2, pp. 78–86, 1 graph, 1934.

A non-parasitic wilt of cacao locally termed 'sudden death', the symptoms of which closely resembled 'plethora' disease in St. Thomas Island, Gulf of Guinea [*R.A.M.*, xiii, p. 220], was common in the Dumbara Valley, Ceylon, in 1933. It is considered to have resulted from marked fluctuations in rainfall, though aluminium poisoning due to soil deficiency in exchangeable lime may have been a contributory factor. Suggestions are made for combating the disease by the provision of adequate shade and manuring.

Israilsky (V.) & Kazakova (Mme A.). Бактериозы Пшеницы. (Предварительное сообщение.) [Bacterioses of Wheat. (Preliminary communication.)]—*ex* Биохимия и микробиология Пшеницы [Biochemistry and microbiology of Wheat], *Pan-Soviet Scient. Inst. of Cereal Res.*, Moscow, *Publ.* 13, pp. 38–40, 1934.

Isolations in 1932 from samples of wheat affected with black chaff [presumably from the Ukraine: cf. *R.A.M.*, xi, p. 285] yielded practically pure cultures of a bacterium which in artificial culture produced colonies very similar to those of *Bacterium translucens*. In its biochemical properties, however, it was found (as shown in a comparative table) to be intermediate between this organism and *Bact. atrofaciens* [ibid., xii, p. 431], and may possibly be a variant of the former. Tests were started at Kharkoff [Ukraine] in 1932 to determine whether the disease is transmitted through soil or carried by naturally or artificially infected seed-grain.

Grooshevoy (S. E.) & Maklakova (Mme G. F.). Ржавчина зерновых культур и меры борьбы с ней. [Rusts of cultivated cereals and their control.]—30 pp., 14 figs., Госуд. Издат. Колхоз. и Совхоз. Литературы [State Publishing Office of Collective and Soviet Farming Literature], Moscow, 1934.

In the introductory section to this paper the authors state that now

that the campaign for controlling the cereal smuts [*Tilletia*, *Ustilago*, and *Urocystis* spp.] is approaching completion in the U.S.S.R., cereal rusts [a brief morphological and biological account of which is given] have become one of the outstanding and urgent problems of Russian agriculture, owing to the huge losses caused by them almost every year. For instance, the shortage attributable to them in 1932 is estimated at a value of 322·5 million roubles [nominally £32,250,000]. Stem [black] rust of wheat [*Puccinia graminis*] is especially destructive in the Russian Far East and the south-eastern districts of North Caucasus, where it contributes to a large extent to the gradual reduction from year to year in the wheat acreage. In the remaining areas of Russia and Siberia its occurrence on wheat is for the most part sporadic and restricted, but it attacks rye and oats much more severely. Crown rust [*P. lolii*] of oats very frequently destroys over 50 per cent. of the crop in the chief oat-producing regions of the Union (Ukraine, Central Chernozem provinces, and White Russia), where the total losses caused by it in 1932 are stated to have amounted to over 1,000,000 tons of grain. It also did considerable damage in 1933. Among the leaf rusts, the brown [*P. triticina*] and yellow [*P. glumarum*] rusts of wheat very often reduce the yield by 50 per cent. and over in North Caucasus and the south-west of the Ukraine, while in the rest of the Union the losses average about 20 per cent. in years of heavy infection, and some 10 per cent. in other years.

In discussing control methods, experimental dusting with sulphur from aeroplanes is stated to have given satisfactory results in some areas, where the treatment reduced the injury from the rusts by 40 to 50 per cent. In other regions, however, the results were disappointing, and hardly warranted the expenditure of time and sulphur dust; were the dusting to be methodically performed over the whole territory of the Union growing cereals it would require many hundred thousand tons of sulphur annually, and moreover, as it was shown that one aeroplane can only treat effectively an area not exceeding 1,000 hectares, would necessitate the creation of fleets of thousands of aeroplanes surpassing any practical possibility. The treatment can be financially sound only in regions where the rusts are particularly severe, and in years of heavy epidemics.

Control by the use of resistant varieties is not practicable in the U.S.S.R., owing chiefly to the present paucity of known resistant varieties, and to the fact that varieties resistant to one rust are highly susceptible to others and to various serious diseases such as the *Fusarium* rots, besides lacking agronomic qualities. The only variety which so far deserves to be widely tried is the No. 053 variety of oat, produced by the Verkhnyatcheskaya Plant Protection Station, which is very resistant to crown rust. The only promising means of control are improved cultural measures and the suppression of the alternate hosts of the rusts, especially barberries and buckthorns [*Rhamnus* spp.], the eradication of which is discussed in some detail. Sufficient and well-balanced fertilization promotes the rapid and vigorous development of the cereal plants, and renders them more resistant to rust. In many cases the severity of infection was markedly reduced by applications of phosphatic and potassic fertilizers, with or without the addition of

nitrogenous substances; excess of nitrogen should, however, be avoided, as it tends to render the plants less resistant.

Sowing of winter varieties of cereals should be done at the optimum period, dependent on the local ecological conditions, in the autumn. Too late sowing is deprecated for the reason that it prolongs the date of maturation of the plants, which are thus subjected to a longer period of infection with air-borne uredospores from the earlier crops. For the same reason it is strongly recommended that autumn sowing should be done rapidly (within 10 days) in a given area, delimited by the prevailing climatic conditions, and only varieties homogeneous in their date of maturation and in their resistance to the rusts should be employed. As instancing the bearing of the date of autumn sowing on the development of brown leaf rust of wheat, a reference is made to experiments made in 1928 and 1929 at the Mironovka Experimental Station [Ukraine] (where the optimum period of sowing is normally from the 9th to 14th of September), the results of which showed that towards the end of October all the wheats sown in August were severely infected with rust from nearby stubble and volunteer wheat, while in the plots sown at the normal time only a few scattered uredosori could be found after prolonged search. Later in the autumn, however, the normal plots became very heavily infected from the neighbouring early ones and from volunteer plants within the crop. The rust overwintered as mycelium in the plants, with the result that in the following spring it broke out severely at the time of ear-formation and flowering, i.e., from 15 to 20 days earlier than in normal sowings. The experiments also showed that with 100 per cent. infection at this stage of growth, the yield was reduced by over 50 per cent., while when the rust attack developed with the same intensity 15 to 20 days later, i.e., at the milky stage, the yield was reduced only by 24 or 25 per cent.

As a further preventive measure, it is recommended that winter wheats should not be grown intermixed with, or in close proximity to spring varieties, as they are an unfailing source of infection for the latter. Spring sowing should be done as early as possible. Old stubble and volunteer plants should be carefully destroyed by fire or deep ploughing, followed by clean fallow, when in close proximity to cereal fields.

ZEKL (F.). **Ursachen des Weizen-Rostes.** [Causes of Wheat rust.]—*Deutsche Landw. Presse*, lxi, 32, p. 397, 1934.

The Austrian wheat harvests in four out of the twelve years analysed by the writer are stated to have been appreciably damaged by rusts [*Puccinia graminis*, *P. glumarum*, and *P. triticina*: *R.A.M.*, xiii, p. 752]. The mean grain yield during the 12-year period averaged 2,193 kg. per hect., whereas taking the four bad years only the average was 1,717 kg. against 2,428 kg. for the remaining eight years, a reduction (considered to be due to rust) of 711 kg. per hect. The wheat uniformly followed clover or lucerne, an inadvisable sequence from the standpoint of rust infection but favoured by farmers on account of the stimulus to growth afforded by the nitrogenous effect of these leguminous crops. The seasons of heavy rust infection were characterized by low precipita-

tion, great heat, much sunshine, and high atmospheric humidity in July [ibid., xii, p. 359]. In one of the eight non-epidemic years, however, most of these conditions were present, but this happened to be the only year with such conditions in which the usual spring top-dressing with nitrate was omitted owing to the excellent growth of the crop in the spring.

Viennot-Bourgin (G.). **Contribution à l'étude des Urédinales en Seine-et-Oise (7e Note). De l'activité de Puccinia glumarum (Erikss. & Henn.) en période hivernale dans la département de Seine-et-Oise (région sud).** [Contribution to the study of the Uredinales of Seine-et-Oise (7th Note). On the activity of *Puccinia glumarum* (Erikss. & Henn.) in winter in the Department of Seine-et-Oise (south region).]—*Bull. Soc. des Sciences de Seine-et-Oise*, Sér. III, ii, 3–4, pp. 21–36, 1934.

Six years' field and laboratory investigations conducted at Grignon into the overwintering of *Puccinia glumarum* showed that a number of distinct biologic forms are present locally. During autumn uredospores from volunteer wheat and barley plants are able to infect the seedlings of the normal autumn sowings. If unfavourable weather prevails the mycelium lives on within the latter, resuming uredospore production with the return of better conditions. The author considers that his evidence does not support the view that 'plant refuges', e.g., secondary (grass) hosts on which the cereal parasite is able to develop in the uredo stage during autumn and winter so as to be able to reinfect the crop in the spring, play an important part in the cereal rust problem in the area concerned.

Becker (K. E.). **Die amtlich empfohlenen Beizmittel nach dem Stande vom 4. August 1934. Das Wichtigste zur Herbstbeizung.** [The status of the officially recommended disinfectants on 4th August, 1934. The essential in autumn disinfection.]—*Deutsche Landw. Presse*, lxi, 34, pp. 421–422, 1934.

A table is given showing the appropriate concentrations and duration of treatment for the various fungicides officially recommended by the German Plant Protection Service against the four principal seed-borne diseases of cereals, viz., wheat bunt [*Tilletia caries* and *T. foetens*], snow mould of rye [*Calonectria graminicola*], stripe disease of barley [*Helminthosporium gramineum*], and loose smut of oats [*Ustilago avenae*: *R.A.M.*, xii, p. 84]. Some general directions for the choice and application of the different treatments are also given. Effective against all the diseases in question, where immersion is practised, are ceresan U. 564, fusariol 157, germisan, and uspulun-universal [see next abstract]; all but the last-named may also be used in the sprinkling method (except against *U. avenae*, amenable to control by sprinkling only with formaldehyde). In the short disinfection process ceresan and germisan give effective control of all the diseases. Abavit-universal (not to be confused with abavit B) [ibid., x, p. 94; xii, p. 152; xiii, p. 2, *et passim*] and ceresan are the most suitable general dusts for the purpose under discussion.

Lindfors (T.). **Försök med utsädesbetning utförda 1931–32.** [Experiments in seed disinfection carried out in 1931–32.]—*Statens Växtskyddsanst. Medd.* 5, 23 pp., 1934. [German summary.]

A comprehensive account, supplemented by 13 tables, is given of the laboratory and field experiments in the disinfection of cereal seed-grain against various fungous diseases and of sugar-beet against *Phoma betae* carried out in Sweden during 1931–2 [*R.A.M.*, x, p. 510]. Good control of snow mould of rye [*Calonectria graminicola*] was given by uspulun dust (U.T. 687), tutan, betoxin, and B88, applied at the rates of 1·5, 1·5, 2, and 3 gm. per kg., respectively. The most promising results in the elimination of stripe smut of rye [*Urocystis occulta*] were obtained with uspulun in the first year's tests and with tutan and 0·1 per cent. mercuric chloride (20 minutes' immersion) in the second series of trials.

Absolute control of wheat bunt [*Tilletia caries* and *T. foetens*] was secured by sprinkling the seed-grain with a 2 per cent. solution of U. 520 (30 c.c. per kg.), while virtual freedom from infection was also conferred by uspulun dust (2 gm. per kg.) and fusariol dust 844 (3 gm. per kg.). Moderately satisfactory results were further obtained with 2 per cent. germisan (moistening at the rate of 30 c.c. per kg.), tutan (2 gm. per kg.), fusariol dust 1416, B 110, and B 111 (all at 3 gm. per kg.).

Stripe disease of barley [*Helminthosporium gramineum*] was effectively combated by 30 minutes' immersion in 0·2 per cent. germisan or 0·25 per cent. uspulun-universal, sprinkling with 2·5 per cent. germisan or U. 520 (30 c.c. per kg.), and dusting with uspulun (3 gm. per kg.).

Only two preparations gave adequate control of loose smut of oats [*Ustilago avenae*], namely, 0·25 per cent. germisan solution (30 minutes' immersion) and havretillantin dust (3 gm. per kg.); these treatments, and also tutan (4 gm. per kg.), augmented the yield by an average of 4 per cent. Considerably more effective in the latter respect was uspulun dust (3 gm. per kg.), which doubled the yield. Like tutan, however, it failed to eliminate smut completely and should thus be used only on slightly infected seed-grain.

Uspulun dust (6 gm. per kg.) was the only one of four disinfectants to give an encouraging result in the control of *P. betae* on sugar beets on clay soil with an alkaline reaction near Linköping.

Schouten (A.). **Lohnbeizeinrichtungen in Holland.** [The hire system of seed disinfection in Holland.]—*Nachricht. über Schädlingsbekämpf.*, ix, 3, pp. 136–141, 5 figs., 1934.

Of increasing importance and popularity in Holland is the hire system of seed-grain disinfection with ceresan dust, applied by mechanics travelling round the country with portable dusting machines affixed to bicycles or motor trucks and in some cases run off the engine of the latter. The writer predicts a considerable extension of utility for this practice. Many seedsmen now supply their customers exclusively with ceresan-treated seed-grain, while co-operative societies and similar associations also use this method of disinfection.

MOURASHKINSKY (K. [E.]). Подзимние посевы яровой Пшеницы и пыльная головня. [Late autumn sowing of spring Wheats in relationship to bunt.]—*На Защиту Урожая* [*Crop Protection*], *1934*, Moscow, 8, pp. 23–24, 1934.

This is a very brief account of experiments in 1933 in western Siberia, the results of which showed that late autumn sowing of spring wheats was not effective, as suggested by certain Russian authors, in reducing the incidence or severity of wheat bunt [*Tilletia caries* and *T. foetens*] in that region.

LEE (A. A.). **Ball smut in Wheat. Methods of control.**—*Journ. Dept. Agric. Victoria*, xxxii, 2, pp. 57–59 and 75, 3 figs., 1934.

The author states that experiments during a number of years at Longerenong, Rutherglen, and Werribee (Victoria) have shown that dusting wheat seed-grain with copper carbonate gave better control of wheat bunt [*Tilletia caries*: *R.A.M.*, xii, p. 275] than steeping the grain in either copper sulphate or formalin solutions. The tests at Rutherglen, in particular, showed that wheat raised from grain dusted with copper carbonate outyielded that produced from formalin-treated seed by 3 bushels per acre and that obtained from copper sulphate-treated seed by 4·4 bushels.

VASSILIEVSKY (A.). Эффективный протравитель—тальк-арсин.—[Talc-arsin—an effective seed disinfectant.]—*На Защиту Урожая* [*Crop Protection*], *1934*, Moscow, 1, pp. 36–37, 1 graph, 1934.

This is a brief report of field tests in 1932 in the neighbourhood of Moscow of the efficacy in the control of wheat bunt [*Tilletia caries* and *T. foetens*] of talc-arsin dust, which is stated to contain only 2·3 per cent. of As_2O_3, as against 9·91 per cent. in Davydoff's preparation, which superseded in 1933 the copper carbonate dust AB [*R.A.M.*, xii, p. 617]. In one test it completely suppressed bunt in the ensuing crop, while Davydoff's preparation gave 1·8 per cent. infection, with 35·7 per cent. in the control plot; in another trial, the seed treated with talc-arsin gave 0·37 per cent. infection, seed treated with Paris green dust 0·67 per cent., that treated with Davydoff's preparation 1·65 per cent., with 67·3 per cent. bunt in the controls. Results in 1933 confirmed those of the preceding year, although complete control of bunt was not attained. The dose of all the three dusts per cwt. of seed-grain is the same.

LUTHRA (J. C.) & SATTAR (A.). **Some experiments on the control of loose smut, Ustilago tritici (Pers.) Jens., of wheat.**—*Indian Journ. Agric. Sci.*, iv, 1, pp. 177–199, 2 diags., 1934.

Loose smut of wheat (*Ustilago tritici*) is common in the Punjab, where it is estimated to cause an average annual loss of at least 2 per cent. of the crop, representing a value of £400,000. The writers have evolved four methods of controlling this disease, of which one, the simplified hot water treatment, has been successfully used on a large scale on experiment stations for the last five years. The procedure is as follows.

The wheat (Punjab 8–A was chiefly used in the experimental work) is pre-soaked in unheated water at 60° to 85° F. for four to seven hours, dipped in water at 120° for five minutes, immersed in water at 127° to 132° for seven minutes, and thoroughly dried prior to immediate or subsequent sowing. This method is relatively simple but demands a certain amount of skill in the maintenance of the required temperatures, so that it can only be applied by educated farmers. On the other hand, the single-bath, sun-heated water, and solar energy methods are within the capacity even of the illiterate local peasantry. In the single-bath treatment the seed-grain is soaked for four, six, or eight hours in water at 105°, 110°, or 115°, respectively. For sun-heating, the seed-grain is exposed on a sunny day between June and August to heating by the sun from 12 noon to 4 p.m. in a blackened, cylindrical, galvanized iron vessel, 30 by 6 in., half-filled with water, and then dried. The solar energy method consists merely in the exposure to the sun from noon till 4 p.m. of moistened seed-grain previously soaked in water at normal temperature from 8 a.m. till noon. The last three methods are applicable in their present form, only to the hotter parts of the Punjab plains, while the first is adapted for use in the hills.

Mourashkinsky (F.). Новый метод борьбы с пыльной головней Пшеницы. [A new method for the control of loose smut of Wheat.] —*На Защиту Урожая* [*Crop Protection*], *1934*, Moscow, 1, pp. 30–31, 1934.

In this brief note the author states that experiments in 1933 in western Siberia confirmed the efficacy in the control of loose smut [*Ustilago tritici*] of wheat of the method recently devised by Gassner [*R.A.M.*, xii, p. 499; xiii, p. 750]. Locally, soft wheats (*lutescens*) were shown to be more resistant to the treatment than hard ones (*hordeiforme*), since the amount of smut which developed in the *lutescens* plants raised from treated seed was reduced to 12 per cent. by steeping the grain for eight hours in 5 per cent. ethyl alcohol solution at 40° C., as against 55·8 per cent. in the controls, while the smut was entirely absent from the *hordeiforme* crop raised from seed treated for three hours with the same dilution of alcohol at the same temperature.

Szembel (S. [I.]). Пшеница Закавказия под угрозой. [Threat to Wheat in Transcaucasia.]—*На Защиту Урожая* [*Crop Protection*], *1934*, Moscow, 8, pp. 22–23, 1934.

The author states that flag smut of wheat (*Urocystis tritici*) was first recorded causing an insignificant amount of infection in Azerbaijan [south-western littoral of the Caspian Sea] in 1930. It spread very rapidly, until in 1934 up to 20 per cent. of the wheat-fields in the Republic were found to be infected, and all the affected plants remained unproductive. A very short account of the disease is given, together with a brief discussion of control as practised abroad. Measures are being taken to determine the exact limits of the infected area, with a view to prevent further spread of the disease by strict quarantine regulations, and the notification of the discovery of even a single diseased plant in a field has been made compulsory.

Miller (W. B.) & Millikan (C. R.). **Investigations on flag smut of Wheat caused by Urocystis tritici Koern.**—*Journ. Dept. Agric. Victoria*, xxxii, 7, pp. 365–380; 8, pp. 418–432, 13 figs., 1 graph, 1 map, 1934.

A comprehensive, tabulated account is given of investigations, started in 1927, of flag smut of wheat (*Urocystis tritici*) in Victoria, where much loss is caused owing to the widespread use of susceptible varieties and inadequate control measures. Preliminary tests showed that heavy contamination of the seed with spores is necessary to give accurate data on the relative susceptibility of wheat varieties. Where low infection occurred, many varieties exhibited an apparent resistance out of proportion to their true inherent resistance.

A number of varieties proved to be resistant or moderately resistant [cf. *R.A.M.*, xii, p. 18; xiii, p. 568], and their use was shown in the field experiments in seven centres to provide a valuable means for the control of the disease in affected areas. Of these Ghurka wheat is especially valuable, since it has proved to be a prolific variety in many districts. In susceptible varieties the number of totally infected plants usually exceeds that of partially infected ones, the reverse being generally true in resistant varieties. Attempts to obtain resistant strains by selection from susceptible varieties have been so far unsuccessful.

Spore germination in *U. tritici* and subsequent infection of the seedlings is favoured by the absence of excessive moisture in the soil, and by soil temperatures above 50° F. The development of the disease is promoted by conditions which tend to prolong the susceptible seedling stage of the host. In manurial tests at Rutherglen and Walpeup superphosphate generally reduced infection, but the effect of lime and sulphate of ammonia varied. Severe infections were obtained in soils with a P_H range of 5·5 to 8·7. The results of analyses indicated that the development of the fungus in the host tissues is apparently influenced by a general increase in the percentages (on a dry weight basis) of nitrogen, ash, lime, potash, and phosphoric acid during the early stages of growth, but no relation could be established between the resulting infection and any single constituent.

The results of replicated trials with inoculated and clean seed-grain, to determine the effect of flag smut on yield, indicated that in general the ratio of reduction in yield to percentage of smut was greatest in resistant varieties, the increased reduction (as compared with that in susceptible varieties) being apparently due to 'suppressed' (not outwardly visible) infection; this was particularly noticeable in the Ghurka variety, and was not evident in Nabawa [ibid., xii, p. 18]. Experiments to test the effect on the smut of cultural practices showed that deep sowing tended to increase infection, and that the losses resulting from flag smut were slightly increased by cutting back the infected plants. Seed treatment with copper-containing powders did not give complete control in the case of heavy infection of the seed-grain, but was effective under ordinary working conditions [cf. next abstract]. The paper terminates with a number of recommendations for the control of the disease and a bibliography of 74 titles.

Dawson (G. T.). **Seed-borne flag smut infection. Effectively controlled by copper carbonate treatment.**—*Agric. Gaz. New South Wales*, xlv, 8, pp. 431–432, 2 figs., 1934.

In tests conducted over a period of six years in New South Wales in which wheat seed heavily inoculated with flag smut [*Urocystis tritici*: see preceding abstract] was dusted with copper carbonate (2 oz. per bushel) or dipped for three minutes in a $1\frac{1}{2}$ per cent. solution of copper sulphate and then in lime-water, the dusted seed gave an average yield of 27 bushels 40 lb. an acre, with 4·33 per cent. infection, the corresponding figures for the wet treatment being 23 bushels 49 lb., and 7·3 per cent., and for the untreated control seed 24 bushels 50 lb., and 21·6 per cent. The copper sulphate and lime treatment impaired the vitality of the seed, and is not recommended.

Graf-Marin (A.). **Studies on powdery mildew of cereals.**—*Cornell Agric. Exper. Stat. Memoir* 157, 48 pp., 1 fig., 8 graphs, 1934.

In the course of investigations [which are fully described and the resulting data tabulated] on various physiological aspects of barley mildew (*Erysiphe graminis*) [*R.A.M.*, xiii, p. 626 and next abstract] at Cornell University, New York, it was found that a higher percentage of germination was obtained from conidia on dry slides in moist air than those in drops of water. The maximum stimulus to germination and germ-tube development was afforded by a nutrient solution of 2·5 per cent. cane sugar. Ascospores were formed in twenty-two hours from asci in perithecia placed in water for twelve hours and then transferred to an incubator at 21° C. The successive inoculation of Alpha barley plants at different ages showed that the tendency to perithecial production increased with advancing age, and that this was correlated with a decline in susceptibility to mildew. It was ascertained that the germ-tubes of *E. graminis* are incapable of penetrating the coarse cuticle of old leaves, which ranges in thickness from 2·5 to 5 μ compared with 0·4 to 1·5 μ in the younger ones. On the removal of the cuticle abundant mildew infection was obtained, indicating that the normal immunity of fully developed leaves from invasion by the fungus is of a purely mechanical order. Affected leaves transpired 67 per cent. more water per unit of leaf surface than healthy ones, mainly due to increased opening of the stomata. Diseased plants had 47 per cent. more dry matter (as a percentage of fresh weight) than healthy, had fewer leaves, with 18 per cent. reduction in individual leaf area and 44 per cent. reduction in the fresh weight of the tops.

Germar (B.). **Über einige Wirkungen der Kieselsäure in Getreidepflanzen insbesondere auf deren Resistenz gegenüber Mehltau.** [On some effects of silicic acid on cereal plants, especially on their resistance to mildew.]—*Zeitschr. für Pflanzenernährung, Düngung und Bodenkunde*, A, xxxv, 1–2, pp. 102–115, 1934.

It was shown by experiments [the results of which are discussed and tabulated] at Jena University that the resistance of Petkus winter rye, Pflugs summer barley, and Hohenswetterbach Bearded and Heines

Kolben summer wheat to mildew (*Erysiphe graminis*) [*R.A.M.*, xi, p. 157; xiii, p. 431; and preceding abstract] was appreciably augmented by the application to the plants (in pots of quartz sand) of silicon dioxide at the rate of 5, 15, or 30 gm. per pot. The cause of the enhanced resistance evidently lies in the silicification of the cell membranes of the leaf whereby the ingress of the haustoria is impeded or prevented.

The treatment was not effective against certain fungi entering the leaves through the stomata.

Rosella (E.). **Les piétins des céréales.** [Cereal foot rots.]—*Prog. Agric. et Vitic.*, cii, 26, pp. 13–17, 1934.

After a brief, popular description of the foot rot of cereals caused by *Cercosporella herpotrichoides* and the root rot due to *Ophiobolus graminis* [*R.A.M.*, xiii, p. 568], the second of which occurs fairly frequently in the region of Paris and is particularly serious in the south of France and in French North Africa (Algeria and Morocco), the author briefly discusses the measures for their control. Among these late autumn sowing, cultivation in ridged rows, and well-balanced manuring are effective against *C. herpotrichoides*, while a sufficiently long crop rotation is considered to be the best means to check *O. graminis*. A warning is again given [ibid., xii, p. 560] against the indiscriminate use of sulphuric acid for the control of *C. herpotrichoides*, in view of the injury it may cause to the cereals, especially when applications are followed by frost.

Sprague (R.). **Preliminary note on another foot rot of Wheat and Oats in Oregon.**—*Phytopath.*, xxiv, 8, pp. 946–948, 1 fig., 1934.

Winter wheat and oats on red sandstone-shale soils with an acid reaction in certain coastal areas of Oregon have been attacked during the past four seasons by a foot rot with symptoms closely resembling those due to *Gibellina cerealis*, reported from northern Italy and Hungary [*R.A.M.*, x, p. 447]. Elongated, pale, dark-edged lesions develop on the lower leaf sheaths and basal nodes of the culms. In early May a dirty white mycelial mat is formed over the lesions on the outer sheaths and between the underlying ones. Gradually a velvety, white stroma is produced, containing small, yellow to brown, abortive fruit bodies. In a few cases immature perithecia, agreeing with those of *G. cerealis*, have been found, but no ripe fructifications have developed, possibly on account of the dry summer climate.

On potato-dextrose agar the fungus produced a rapidly growing, loose to floccose, dirty white mycelium, from which were formed pale yellow, turning orange, then brown sclerotia of a firm, rubbery consistency, hemispherical, up to 6 mm. in diameter, and sometimes aggregating into fair-sized masses. These cultures were found to be identical with two new isolations of *G. cerealis* from Italy. The Oregon form grows best at 18° to 24° C., the minimum and maximum temperatures for development being 6° and 27° to 30°, respectively. The fungus caused a destructive blight of wheat, oats, and barley seedlings in inoculation tests. In the field, barley and most wheats will not grow on acid soil infested by *G. cerealis*, to which oats are less susceptible.

Hirschhorn (J.). **Dos royas de la Cebada, nuevas para la Argentina.** [Two Barley rusts new to the Argentine.]—*Rev. Fac. Agron. Univ. Nac. La Plata*, xix, 3, pp. 390–397, 2 figs., 1933. [Received October, 1934.]

Attention has already been drawn in a preliminary note to the detection in 1930, for the first time in the Argentine, of two rusts on barley, *Puccinia anomala* and *P. glumarum* [*R.A.M.*, xiii, p. 296]. After describing the life-history and symptoms of the former it is stated that judging by the character of the infection on different species (*Hordeum spontaneum* and *H. deficiens*) and varieties (Oderbrucker, Manchuria, Minn. 184, Manchuria × Smooth-awned, and Coast), the biotype of *P. anomala* occurring in the Argentine is distinct from those found in Australia and the United States [ibid., ix, p. 438; x, p. 230; xiii, p. 760].

P. glumarum has been found to occur in a much more virulent form on *H. spontaneum* and its var. *nigrum*, *H. tetrastichum*, and *H. hexastichum* than on *H. distichum.* In 1931 *H. pusillum* Nutt. var. *euclaston* Steud. [*H. euclaston* Steud.] was attacked by yellow rust—apparently an exceptional case.

Poulsen (A.). **Warmwasserbehandlung von Gerste.** [Hot water treatment of Barley.]—*Nachricht. über Schädlingsbekämpf.*, ix, 3, pp. 141–145, 1 fig., 1934.

Very encouraging results have been obtained in Denmark against stripe disease and loose smut of barley [*Helminthosporium gramineum* and *Ustilago nuda*] by the addition to the heated steeping water (51° to 52° C.) of 0·5 or 1 per cent. tillantin (the name under which ceresan liquid U. 564 [see above, p. 20] is marketed in Denmark). Both diseases were adequately controlled without the impairment of germination apt to accompany the hot water treatment alone.

Stelzner (G.). **Experimentelle Untersuchungen über den die Gerstenstreifenkrankheit hervorrufenden Pilz Helminthosporium gramineum Rbh. unter besonderer Berücksichtigung seiner Infektionsverhältnisse.** [Experimental investigations on the fungus causing Barley stripe disease, *Helminthosporium gramineum* Rbh., with special reference to its mode of infection.]—*Bot. Arch.*, xxxvi, 3, pp. 301–344, 9 figs., 1934. [English summary.]

A comprehensive, tabulated account is given of the author's investigations at Leipzig on the stripe disease of barley caused by *Helminthosporium gramineum* [*R.A.M.*, x, p. 231 *et passim*], with special reference to the mode of infection by the fungus.

The penetrating hyphae are first found in the radicles of the seedlings, especially in the region of the collar. Through the root node they pass into the hypocotyl and subsequently infect the entire plant. Hyphae entering by way of the coleoptiles cause noticeable infection of the basal leaf, but unlike those entering by the root, they do not involve the whole plant. The vegetation cone is permeated by the mycelium reaching the hypocotyl from the root node, and all the newly developing plant organs contract infection from the invaded axis. The fungus penetrates the vascular bundles of the leaves, rapidly extending the entire length within the tracheids and tracheae and producing by this parallel course

the familiar striped effect. The vessels are disorganized and the vital activities of the adjoining parts interrupted. The hyphae ultimately spread chiefly in a transverse direction, invading and destroying the enfeebled leaf parenchyma. In places a thick fungal cell plate, rich in protoplasm, is formed as a basis and food reservoir for the developing conidiophores. Under the influence of strong pressure, e.g., by wind, the foliar stripes rupture and present the well-known split aspect. In the haulm the fungus occurs principally in the zone of intercalary growth, whence the pith cavity is later attained. Occasional foci of infection may also be encountered in the vascular bundles of the haulm, but in general the rapid lignification of this region is adverse to the spread of *H. gramineum*. From the tracheids and tracheae of the ear the mycelium grows into the individual flowers, causing no appreciable damage if maturity is well advanced; it has even been obtained in pure culture from the pollen grains.

The latent occurrence of the stripe fungus has been observed in summer barley [ibid., xii, p. 109], causing general weakening of the plants and decay of the roots with consequent severe winter injury. Early sowing (between 8th March and 7th April 1933) was found to favour infection of the Isaria variety, whereas no apparent influence on the course of the disease was exercised by nutritional factors. A high degree of susceptibility to stripe was shown by Ackermanns Isaria and Bavaria and Heines Hanna, while Criewener 403, Nolč, and v. Dregers Bohemia and Allerfrüheste gave evidence of resistance to infection. The disease occurred in a moderately to very severe form on the progeny of Franken and Hanna barley used in the tests. *Hordeum spontaneum* and *H. zeocriton* contracted severe infection under natural conditions.

Practically complete control of *H. gramineum* was given by the following treatments: one hour's immersion in solutions of 0·25 per cent. uspulun-universal or 0·125 per cent. germisan, 30 minutes in 0·25 per cent. germisan, germisan short disinfection process (3 l. of a 2·5 per cent. solution per 100 kg. of seed-grain), and ceresan dust (3 gm. per kg.) [ibid., xiii, p. 627, and above, pp. 20, 21].

Stripe disease causes a material reduction of the whole substance of the plant as well as of its non-nitrogenous extractives; on the other hand, constituents originating in the soil, like nitrogen and ash, show a considerable increase. Infected plants are characterized by enhanced relative transpiration.

Conidiophores bearing conidia develop rapidly on infected barley leaves in a moist chamber at 20° C. The length of the conidial cells is a fixed specific character showing only insignificant variations. Conidial germination was found to be most profuse on neutral soil extract, on which fresh conidia extruded germ-tubes in four hours. Conidial germination is not affected by temperature fluctuations between 4° and 20°. Sclerotia are produced by *H. gramineum* in pure cultures on plum agar at P_H 5·8. The temperature limits of mycelial growth lie at 3° to 4° and 32°. The reaction of the substratum is shifted towards the alkaline side by the development of the mycelium; the latter process is retarded by strong sunlight. In pure culture the mycelium retains its viability for at least a year and in the barley plant for considerably longer.

GARBER (R. J.) & HOOVER (M. M.). **Dehulled seed, glume color, and reaction to smut in a certain Oat cross.**—*Journ. Amer. Soc. Agron.*, xxvi, 8, pp. 673–680, 1934.

In continuation of previous experiments [*R.A.M.*, ix, p. 298], the writers have secured additional data on the factors governing reaction to loose and covered smuts (*Ustilago avenae* and *U. levis* [*U. kolleri*]) in the oat varieties Black Mesdag and Gopher and certain descendant lines from hybrids between them.

The reaction both of the parents and of the progeny to each of the two smuts was similar. A material increase of infection and mortality followed dehulling the seed prior to treatment. Eighty F_2 descendant families from the back-cross 17–10–75–5–1 $\times F_1$ and reciprocal, and 53 similar families from the Gopher $\times F_1$ back-cross and reciprocal were grown under smut epidemic conditions. The resultant data corroborated in general those obtained earlier in respect of glume colour and smut reaction inheritance. The back-crosses gave no significant evidence of a close linkage between the gene for black glumes and that responsible for increased susceptibility to smut, although in one such cross a slight predominance of highly susceptible families came from black (15) as compared with white (11) seed.

NIEVES (R.). **Nota preliminar sobre un probable hibrido natural (Avena byzantina × A. fatua) atacada por Ustilago levis.** [A preliminary note on a probable natural hybrid (*Avena byzantina* × *A. fatua*) attacked by *Ustilago levis*.]—*Bol. Mens. Min. Agric. Nac.*, Buenos Aires, xxxvi, 1, pp. 73–79, 1934.

Hybrid oats (probably resulting from natural crossing between *Avena byzantina* and *A. fatua*) near the Guatraché Experiment Station, Argentine, were observed in November 1933 to be attacked to the extent of 46 per cent. by a smut which in most cases resembled *Ustilago levis* [*U. kolleri*], but in some was more like *A. avenae* or was intermediate between the two [*R.A.M.*, xii, p. 622]. The evidence is so far insufficient to determine whether these types of the smut (which causes a 20·5 per cent. reduction in the height of the plants) are the result of natural hybridization between *U. kolleri* and *U. avenae* or merely of variation in the former.

MASCHHAUPT (J. G.). **Das Rätsel der Dörrfleckenkrankheit.** [The mystery of the grey speck disease.]—*Zeitschr. für Pflanzenernährung, Düngung und Bodenkunde*, B, xiii, 8, pp. 313–320, 1934.

As a result of extensive observations in the Groningen district of Holland on the grey speck disease of oats [*R.A.M.*, xi, p. 363; xii, p. 19], the writer makes the following recommendations for its control. An attempt may be made to improve by liming the condition of clay soils definitely ascertained to be poor in calcium, provided the humus content is reasonably low. Where the latter, however, exceeds 6 per cent., great care should be exercised in the application of lime, even where there is a marked calcium deficiency, and the reaction of the soil to liming should first be experimentally determined. On all soils where grey speck disease is a factor to be considered, nitrogen should be

given in the form of ammonium sulphate and never in that of Chile saltpetre. On the appearance in late May or early June of unmistakable symptoms of the disorder, 50 to 100 kg. of manganese sulphate per hect. should be applied as early as possible.

Stakman (E. C.), Cassell (R. C.), & Moore (M. B.). **The cytology of Urocystis occulta.**—*Phytopath.*, xxiv, 8, pp. 874–889, 3 pl., 1 fig., 1934.

This is an expanded account of the writers' studies on the cytology of *Urocystis occulta*, the agent of flag smut of rye, a summary of which has already appeared [*R.A.M.*, xiii, p. 435]. The sporidia of the fungus do not appear to become detached from the promycelium or to bud extensively, so that the opportunities for variation through hybridization would seem to be restricted. This supposition is borne out by the result of a limited number of tests on several rye varieties with different collections of the smut, in which no clear-cut evidence of divergences in pathogenicity was obtained.

Gioelli (F.). **Fenomeni di antagonismo tra 'Penicillium digitatum' (Pers.) Sacc. e 'Penicillium italicum' Weber.** [Phenomena of antagonism between *Penicillium digitatum* (Pers.) Sacc. and *Penicillium italicum* Weber.]—*Ann. di Botanica*, xx, 2, pp. 327–346, 1933. [Received October, 1934.]

Investigations [which are fully described] showed that when *Penicillium digitatum* and *P. italicum* were inoculated into oranges and lemons their mutual antagonism [*R.A.M.*, xii, p. 168] became progressively more pronounced as the temperature was lowered; at moderately high temperatures growth was so rapid that the hyphae spread from one colony right up to the other, leaving a distinct line of demarcation but no neutral zone free from hyphae; later, the colonies merged into one another. On pieces of orange and lemon rind and in culture on artificial media *P. digitatum* and *P. italicum* were not mutually antagonistic. When the organisms were grown in media made with juices expressed from the pulp of oranges and lemons, the effect of the addition of fresh juice to the medium in which either fungus had been grown upon the subsequent growth of the other showed clearly that the medium had previously become depleted of its nutrient constituents. The older the cultures of one fungus, the more unsuitable they became for the growth of the other. The toxins liberated by both organisms were largely thermostable and were capable of ultrafiltration.

A bibliography of 64 titles is appended.

Grasovsky (A.) & Shiff (M.). **The effect of ammonium bicarbonate on the storage of Oranges.**—*Hadar*, vii, pp. 168–172, 1934. [Abs. in *Hort. Abstracts*, Imper. Bureau of Fruit Production, iv, 3, p. 168, 1934.]

Good control of the green and blue moulds [*Penicillium digitatum* and *P. italicum*] and *Diplodia* rot [*D. natalensis*] on Palestinian stored oranges [*R.A.M.*, xii, p. 24] was obtained in experiments from 1931–3 by the use of ammonium bicarbonate [ibid., xi, p. 366], the best results being given by the insertion of the crystals within the wrapper. The

treatment was found, however, to increase the incidence of the physiological breakdown known as 'nooksan' [ibid., xii, p. 285] though the losses from this were more than counterbalanced by the elimination of the moulds.

Altson (R. A.). **Fruit-rot or bunch-rot of the Oil Palm.**—*Malayan Agric. Journ.*, xxii, 8, pp. 361–366, 2 pl., 1934.

An investigation of a rot of the fruit bunches of oil palms affecting not less than 40 per cent. of a crop covering 700 acres in Malaya showed that four main types of decay were present, base rot, stigma-end rot, bunch-end rot, and early bunch rot or bunch rot. In the first a brown water-soaked lesion appeared on the base of the fruit, and as it became larger the fruit became detached, but held in place by the bracts, often continuing to rot *in situ*. In the second, sunken areas appeared on the apex of the fruits, which became shrivelled and dry. In the third, the distal end of a bunch decayed and could easily be pulled out, leaving a basal portion which often remained unaffected. In the fourth, the whole bunch was involved and usually decayed during an early stage of development; this form of decay could often be confused with the decay of unpollinated bunches. The disease was constantly associated with a *Fusarium* belonging to the section *Martiella*, a *Bacillus* of the *B. mesentericus* group, a *Flavobacterium* resembling *F. diffusum*, and two species of *Achromobacter*, all of which are considered to be saprophytes attacking tissues weakened by some nutritional disturbance. A typical form of the rot was induced by artificial dislocation of the food supply. It is suggested that the predisposing nutritional disturbance was due to soil deficiency, the effects of which were aggravated or induced by artificial pollination.

Pascalet (M.). **Les maladies cryptogamiques du Caféier au Cameroun.** [The fungal diseases of Coffee in the Cameroons.]—*Ann. de Cryptog. Exot.*, vii, 1, pp. 21–31, 1934.

In this paper the author, who is the Director of the Nkongsamba Coffee Experiment Station, established in 1932 in the Cameroons, gives notes on the symptoms, damage caused by, and control of the following coffee diseases present in the Colony: brown root rot (*Phellinus lamaoensis*) [*Fomes noxius*: *R.A.M.*, xii, p. 286], white root rot (*Leptoporus* [*F.*] *lignosus*) [ibid., xii, p. 91], root and branch necrosis caused by *Polyporus coffeae* [ibid., xi, p. 699] and also by *Botryodiplodia theobromae*, *Rhizoctonia* attacking the collar and roots, pink disease (*Corticium salmonicolor*) [ibid., x, p. 788], trunk and branch cankers due to *Nectria coffeigena*, the ascogenous form of *Fusarium coffeicola* [ibid., i, pp. 4, 205], leaf and branch lesions caused by the alga *Cephaleuros virescens* [*C.* (?) *parasitica*: ibid., i, p. 92 *et passim*], *Hemileia vastatrix* [ibid., xii, p. 436], *Cercospora coffeicola*, *Sphaerella* [*Mycosphaerella*] *coffeicola* [ibid., x, p. 775], and sooty mould (*Morphea citri*).

P. coffeae is characterized by a whitish, later somewhat dark, rubbery mycelium harbouring the mealy bug *Pseudococcus citri* [ibid., vii, p. 702]; affected coffee may live on for several years, though death usually occurs during the second year after infection. A few months after the initial attack, which takes place by means of rhizomorphs, the collar

and the primary roots are invaded; only cordons are present at first, but these thicken and anastomose, completely encircling the root. After the death of the bush the completely rotted tissues may develop the fructifications, which recall those of *P. squamosus* Huds. [ibid., xii, p. 44]. The fungus was also found saprophytically on stumps of oil palms, whence it spread to weakened trees. It is most prevalent in very acid (P_H 5), badly drained soils.

The collar and roots of coffee bushes in several plantations showed the presence of a *Rhizoctonia* having a superficial, violaceous mycelium consisting of septate hyphae branched at right angles; underneath the decomposed bark black pustules were found, closely adhering to the ligneous parenchyma.

N. coffeigena, first reported by Hennings in 1893, appears to have come originally from the Cameroons. The mycelium penetrates the bark, which becomes necrosed, and then rapidly attacks the ligneous parenchyma; widespread cankers result, which in the case observed by the author were mainly confined to the top of the stem.

Two-year-old *Coffea robusta* in a European plantation is affected by a new top necrosis characterized by a withering from the terminal bud downwards. The affected bark shows several fungi, including one with pink conidia, the perithecia of a *Gibberella* measuring 125 to 175 μ in diameter, the conidia of a *Pestalozzia* and those of a *Colletotrichum*, probably *C. coffeanum*, and pycnidia 110 to 140 μ in diameter. The condition apparently results from bark infection by the pink conidial form, followed by the perithecial stage, *C. coffeanum*, and the *Pestalozzia*.

H. vastatrix was present sporadically in one area (Dschang), but energetic steps were taken to remove the foci of infection.

Serbinoff (V.). Не допустим потерь от заболевания гоммозом Хлопчатника.—[Let us check the losses to the Cotton crop caused by gummosis.]—*На Защиту Урожая* [*Crop Protection*], *1934*, Moscow, 1, pp. 23–26, 3 figs., 1934.

After a brief popular account of the damage done to cotton by gummosis (*Bacterium malvacearum*) [*R.A.M.*, xiii, p. 696], the author states that in the U.S.S.R. the disease is most prevalent and severe in Transcaucasia and Russian Central Asia, chiefly in the areas where Egyptian cotton is mainly grown. While the local varieties are somewhat less susceptible, so far no resistant strain has been found, but in Transcaucasia the King-Karayazskaya 915 strain exhibits the lowest susceptibility. Under Central Asiatic conditions it was determined that the yield of plants affected with stem gummosis [black arm] is reduced on the average by 60 per cent. of that of healthy plants, while the yield of plants affected with the angular leaf spot form of the disease is reduced by 36 per cent.

Disinfection of cotton seed with sulphuric acid was introduced in the U.S.S.R. in 1930, and field experiments in Central Asia showed that plants raised from treated seed developed 3·7 per cent. gummosis at the first leaf and 4·7 per cent. at the blossoming stages, as against 15·8 and 21·1 per cent., respectively, in controls. In further tests the treatment, effected by hand (as described in a sheet of instructions now in course of publication), was shown to be financially sound. In view of

the costliness of the sulphuric acid treatment, a search was made to find cheaper disinfectants, among which dusting with AV [the composition of which is not given], copper carbonate, calcium arsenate, and a few other dusts gave good results, and steeping in a 1 in 100 formalin solution was shown to be very effective. In infected areas, seed treatment must be supplemented by flooding of the soil [loc. cit.], the removal of infected plant material and deep ploughing immediately after harvest, and careful roguing out of all infected seedlings when thinning the stands in the spring. Insect vectors of the bacterium were not found in either of the two regions examined.

PETCH (T.). **Contributions to the flora of Tropical America: XX.**—*Kew Bull. Misc. Inform.*, *1934*, 5, pp. 202–205, 1934.

Taxonomic notes are given on twelve species of entomogenous fungi collected by P. Richards on the Oxford University Expedition to British Guiana in 1929. The list comprises two species each of *Hypocrella* and *Aschersonia*, six of *Cordyceps*, and one each of *Ophiocordyceps* and *Stilbum*.

BOURNE (A. I.) & SHAW (F. R.). **Notes on fungus attacking Onion thrips.**—*Journ. Econ. Entom.*, xxvii, 4, pp. 860–861, 1934. [Abs. in *Rev. Appl. Entomol.*, Ser. A, xxii, 11, p. 650, 1934.]

Large numbers of onion thrips (*Thrips tabaci*) found in 1932 on onion leaves in Massachusetts were completely filled with the mycelium of *Empusa* (?) *sphaerosperma* [*R.A.M.*, vii, p. 322]. The fungus was subsequently found to be well distributed throughout the onion-growing section of the Connecticut River Valley, where its development in many fields coincided with a sharp decline in the incidence of thrips about mid-August. Adverse weather conditions during the corresponding period in 1933 prevented a similar effect of the fungus.

ROZSYPAL (J.). **Houby na hád'átku Řepném Heterodera schachtii Schmidt v moravských půdách.** [Fungi on the Beet eelworm *Heterodera schachtii* Schmidt in Moravian soils.]—*Bull. Czecho-Slovak Acad. of Agric.*, x, 6–7, pp. 413–422, 1 pl., 8 figs., 1934. [German summary.]

Many of the beet eelworm (*Heterodera schachtii*) cysts isolated from the soil in a sugar beet field in Moravia contained dead eggs and larvae, permeated by the mycelium of three fungi, which were apparently identical with the organisms briefly described in 1930 from the Ukraine in a preliminary communication in Russian by I. I. Korab (Výsledky prozkumu hád'átka řepného *Heterodera schachtii* Schmidt, získaně v laboratoři biolocerkovské [Results of the investigation of the beet eelworm, *Heterodera schachtii* Schmidt, conducted at the laboratory in Bielaya Tzerkov], 1930) under the names *Torula heteroderae* n. sp., *Olpidium nematodae* Skwortzoff (*Arch. f. Protistenkunde,* lvii, 1927), and *Protomycopsis* sp. A specimen of *T. heteroderae* which was sent to the Centraalbureau voor Schimmelcultures in Baarn was referred there to *Trichosporium populneum* Lamb. & Fautr. [*Rev. Mycol.*, p. 145, 1896]. This fungus is stated to be the one that occurs the most frequently in the cysts, and a detailed morphological and cultural description is given of it by the author. The fungus referred to *Protomycopsis* is characterized

by large (70 to 100 μ), round, yellowish chlamydospores with an almost smooth or very faintly warty exospore; the chlamydospores are borne terminally on lateral branches, measuring 50 to 100 by 7 to 11 μ, of the main hyphae. The main and lateral hyphae also frequently bear thin, hyaline processes, but it was not possible to determine whether these finally formed long clamp-connexions by anastomosis or developed into some kind of haustorium. *O. nematodae* is stated to be of rare occurrence in the Moravian material.

ALMON (LOIS) & STOVALL (W. D.). **Serologic reactions of cultures of Monilia and of some other yeastlike fungi.**—*Journ. Infect. Dis.*, lv, 1, pp. 12–25, 1934.

Of a number of species of *Monilia* and related genera investigated by direct agglutination procedures, only two cultures of *Torula* were entirely specific in their antigenic characteristics. Absorption of *M.* [*Candida*] *albicans* or *M. candida* [*C. vulgaris*] antisera by *Mycoderma* or *Endomyces* cultures left antibodies for species of *Monilia* only. Absorption of *Mycoderma*, *Endomyces*, *Saccharomyces*, and *Willia* antisera by the three species of *Monilia* tested (*M. parapsilosis* [*R.A.M.*, xiii, p. 370] and the two mentioned above) deprived these sera of agglutinins effective for the *Monilia* group, but left some capacity to agglutinate cultures of the other fungi used in the studies. Absorption of *M. parapsilosis* antisera by *C. albicans*, *C. vulgaris*, or *S. cerevisiae*, if the serum showed no titre for *C. albicans* or *C. vulgaris*, left the sera specific for *M. parapsilosis*. *C. albicans* and *C. vulgaris* behaved as identical organisms so far as absorption was concerned.

SLAGSVOLD (L.). **Spesiell soppifeksjon i huden hos gjet og sau (favus).** [Peculiar fungoid infection in the skin of goats and sheep (favus).]—*Norsk Vet. Tidsskr.*, xlv, pp. 361–373, 8 pl., 1933. (English summary.) [Abs. in *Veter. Bull.*, iv, 8, pp. 504–505, 1934.]

From crusts on the head, ears, neck, back, and the flexor aspects of the joints, which are common as a skin disease of sheep and goats much exposed to damp in western Norway, the author isolated a fungus, probably a *Monilia*, which occurred in the thickened layers of the epidermis and in culture formed very small colonies with long filamentous offsets, the hyphae measuring 2 to 4 μ in diameter at the centre and about 0·5 μ at the periphery. The hyphae tend to divide into refractive segments. Inoculations with pure cultures of the organism produced characteristic lesions on sheep, goats, horses, cattle, guinea-pigs, rabbits, rats, and mice. The fungus remained capable of developing in dried skin and in culture for six months at room or cold storage temperature, but was killed by heating for half-an-hour at 65° C.

TERAI (T.). **Ueber die Dermatomycosen in dem neuen unabhängigen Staat 'Manchoukuo' und über die mycologischen Studien an denselben. (3. Mitteilung.)** [On the dermatomycoses in the new independent State, Manchukuo, and on the mycological studies of the same. (Note 3.)]—*Journ. Orient. Med.*, xxi, 2, pp. 277–286, 5 figs., 1934. [Japanese, with German abstract on p. 23.]

Four species of fungi were isolated from the seven different clinical

forms of dermatomycosis involving 187 patients in northern Manchuria (Manchukuo) in 1933, namely, *Microsporon japonicum* (the most prevalent) [*R.A.M.*, xii, p. 290], *Trichophyton interdigitale*, *T. purpureum* [*T. rubrum*: ibid., xiii, p. 769], and *T. violaceum* [see next abstract].

Artom (M.). **Tricofizia universale con formazioni tumorali da Trichophyton violaceum e glabrum.** [General tricophytosis with tumoral formations due to *Trichophyton violaceum* and *glabrum*.]—*Giorn. Ital. di Dermatol.*, lxxv, 1, pp. 222–223, 1934.

A 49-year-old woman at Verona had been suffering for about 9 years from progressive trichophytosis, starting with peeling of the scalp and developing into inflammation and tumours round the ears and head, extending downwards to the chest and hand. Hyphae isolated from the tissues and blood-stream evolved on various media into *Trichophyton violaceum*, whereas those recovered from hair and epidermal squamae consistently yielded *T. glabrum* [*R.A.M.*, xi, p. 373; xiii, p. 577].

Milochevitch (S.). **Contribution à l'étude du Trichophyton persicolor.** [Contribution to the study of *Trichophyton persicolor*.]—*Ann. de Parasitol. Humaine et Comp.*, xii, 4, pp. 289–295, 1 pl., 1934.

The author gives brief clinical notes on two cases of ringworm, caused by *Trichophyton persicolor* [*R.A.M.*, vii, p. 634], observed by him in Sofia, in one of which the fungus produced endothrix lesions in the beard of the patient. Similar lesions were also produced in guinea-pigs inoculated with the organism. For these reasons he considers that *T. persicolor*, which hitherto was believed to belong to the microides group [ibid., xiii, p. 577], should be referred to the endothrix group [ibid., x, p. 243]. The fungus was grown on Langeron's and Milochevitch's natural media [loc. cit.], on which it produced terminal spirals and crosier-like hyphae.

Acton (H. W.) & Ghosh (L. M.). **Tinea imbricata (tokelau) in Bengal.**—*Indian Med. Gaz.*, lxix, 8, pp. 426–430, 2 pl. (1 col.), 1934.

An account is given of a case (stated to be the first in an Indian of the plains) of tinea imbricata (tokelau) [*R.A.M.*, x, p. 105], a disease which is said to have originated in the Malay Peninsula and has spread to the Pacific Islands, China, Java, Borneo, New Guinea, and Ceylon. Infection in the case under observation may have been contracted from Assam hill tribesmen, among whom the disease is reported to be common. The causal organism appears to occur scarcely at all in a saprophytic form in nature and can only be cultivated in the laboratory from absolutely fresh scrapings, which give good growth on Czapek's medium and other standard substrata. It is characterized by typical faviform colonies, single or concatenate arthrospores, and terminal or intercalary chlamydospores; colour and 'duvet' formation vary greatly with the medium. The creation by Castellani of a distinct genus (*Endodermophyton*) for the causal organisms of tinea imbricata and similar affections [ibid., x, pp. 243, 665] does not seem to the writers to be justified on botanical grounds, and they prefer to name the present organism *Achorion concentricum* Blanchard, 1901 [= *Trichophyton concentricum*: loc. cit.] or alternatively, *A. indicum* Cast., 1911 [cf. also ibid., xiii, p. 512].

WEISE (E. C.). **Another case of sporotrichosis in Connecticut.**—*New England Journ. of Med.*, ccxi, 8, pp. 353–356, 6 figs., 1934.

From ulcers on the leg of a 34-year-old male patient the writer isolated on Sabouraud's maltose agar a fungus characterized by buff-tan to smoky-brown, rugose colonies, radiating from the centre to the periphery; septate, branching hyphae, 2 to 3 μ in diameter; and hyaline, ovoid conidia, 5 by 3 μ, borne in profusion on all parts of the mycelium, either in clusters at the tips of short lateral branches or densely along the side of the main hypha, forming a sleeve-like sheath. The organism was identified as *Sporotrichum schenckii* [*R.A.M.*, xii, p. 569]. This is believed to be the third case of sporotrichosis recorded in Connecticut.

YOUNG (W. J.). **Pigmented mycotic growth beneath the nail.**—*Arch. of Dermatol.*, xxx, 2, pp. 186–189, 6 figs., 1934.

A brief account is given of a black, linear growth, $\frac{1}{8}$ in. wide, extending from the matrix to the tip of the finger-nail in a male patient and causing very severe pain. Cultures from the affected part on Sabouraud's agar were characterized by a dense, black pigment, a vegetative mycelium consisting of smoke-coloured hyphae with numerous septa, and smoke-coloured, pluriseptate conidia formed in terminal heads on single conidiophores. The fungus was identified as *Acrothecium nigrum*.

FOCOSI (M.). **Ueber einen für den Menschen pathogenen Stamm von Cephalosporium.** [On a strain of *Cephalosporium* pathogenic to man.]—*Zentralbl. für Bakt.*, Ab. 1 (*Orig.*), cxxxii, 3–4, pp. 237–240, 3 figs., 1934.

Referring to van Beyma's reported discovery of a new *Cephalosporium* (*C. stuehmeri*) pathogenic to man [*R.A.M.*, xiii, p. 238], the writer points out that an apparently identical fungus had previously been isolated by him from two cases of ophthalmic disease in Italy (*Boll. Ocul.*, pp. 554, 1250, 1934, ref. in *Zentralbl. für Ophthalm.*, xxviii, p. 362; xxix, p. 95).

The Italian organism is characterized by whitish-pink, felty colonies with a raised centre and radial furrows; hyaline hyphae 2·5 to 5 μ in diameter; and conidiophores 17 to 50 by 3 μ, tapering towards the distal end and bearing at the apex round heads 12 by 12 μ, composed of oval, fusiform, or curved conidia, 4 to 8 by 3 to 4 μ. Prof. Pollacci considered this fungus, which is pathogenic to guinea-pigs, to be identical with *C. serrae* Maff., isolated by Serra from a corneal ulcer (*Ateneo parm.*, i, 6, 1929) and studied in detail by Maffei in the same year [*R.A.M.*, ix, p. 593]. It is considered that van Beyma's name, *C. stuehmeri*, is antedated by *C. serrae*.

ZACH (F.). **Untersuchungen über einige neue Arten der Gattung Scopulariopsis Bainier.** [Studies on some new species of the genus *Scopulariopsis* Bainier.]—*Oesterr. Bot. Zeitschr.*, lxxxiii, 15, pp. 173–186, 10 figs., 1934.

Full morphological, physiological, and cultural details, supplemented by Latin diagnoses, are given of five new species of *Scopulariopsis* [cf. *R.A.M.*, xiii, p. 578] isolated from human skin and nails in Vienna,

namely, *S. fusca*, *S. albo-flavescens*, *S. sphaerospora*, *S. oidiospora*, and *S. atra*. No definite statement can be made at present regarding the pathogenicity of these fungi.

OCFEMIA (G. O.). **Bunchy-top of Abacá: its nature and control.**—*Philipp. Agric.*, xxiii, 3, pp. 174–186, 6 figs., 1934.

This is a revision of the writer's previous article 'The bunchy-top of Abacá and its control' (1931) [*R.A.M.*, xi, p. 183] and embodies the results of recent researches on the symptoms, etiology, control, and transmission of this highly destructive disease of abacá [*Musa textilis*] in the Philippines [ibid., xiii, p. 443].

WALTER (MARTA). **Ein gefährlicher Feind unserer Rosen.** [A dangerous enemy of our Roses.]—*Ratschläge für Haus, Garten, Feld*, ix, 8, pp. 136–137, 1 fig., 1934.

Attention is drawn to the prevalence in the Munich district of Germany of rose mildew [*Sphaerotheca pannosa*], primarily on warm south and south-east walls and in places exposed to the trickling of water from roofs. Presumably the enhanced transpiration of the leaves under full solar radiation is accompanied by a decline of turgescence in the cells, which are thus rendered more susceptible to the fungus [*R.A.M.*, xii, p. 715]. In addition to suitable fertilizing [brief recommendations for which are given] and other cultural measures, repeated applications of solbar during the summer have given good control of the disease [cf. ibid., xii, p. 733].

STAPP (C.). **Eine Bakteriose an Chrysanthemen.** [A bacteriosis of Chrysanthemums.]—*Zentralbl. für Bakt.*, Ab. 2, xc, 14–19, pp. 320–329, 3 figs., 1934.

In 1932 a leaf disease of large-flowered chrysanthemums (*Chrysanthemum indicum*) was investigated in pot plants sent from a Westphalian market-garden, where the Deutsche Kaiserin and Sax Export varieties were particularly severely affected, Monument and Pulling being relatively resistant.

Black discolorations extended for varying distances from the tips towards the centres of the older, irregularly pinnate leaves and also occurred here and there in the middle of the lamina. Gradual desiccation ensued, the affected areas assuming a brownish tinge and becoming distorted. In the diseased tissues zoogloeal accumulations of bacteria occurred between the palisade cells. The organism was isolated from the infected material and cultured on a number of standard media. It is a Gram-negative rod with up to five polar flagella, measuring after two days on bouillon agar at 26° C. 1·2 to 3·6 by 0·6 to 0·8 μ (average 1·8 to 3 by 0·6 to 0·7 μ). Gelatine is liquefied and milk peptonized; nitrates are reduced; neither acid nor gas is formed on various carbon compounds; α-alanin is the best source of nitrogen, closely followed by asparagin. Slow growth commenced at 0°; upwards of 5·1° there were indications of fluorescence, which became pronounced between 20° and 28° (the optimum range for development); at 31° a slight decline was perceptible and growth ceased at 42°. The thermal death point was found to lie between 48° and 49°.

The typical symptoms of the disease were reproduced by inoculations with pure cultures of the bacterium on chrysanthemums, the leaves of which contracted infection not only through wounds but also by way of the stomata. Among a number of other phytopathogenic, fluorescent bacteria tested on the highly susceptible Deutsche Kaiserin, *Pseudomonas syringae* [see above, p. 16] produced similar symptoms to those caused by the chrysanthemum organism, while conversely the latter proved capable of attacking lilac, the leaf-tips of which showed discoloration and necrosis. Serological experiments further demonstrated the identity of the chrysanthemum bacterium with *P. syringae*.

Control measures should be based on the avoidance of excessive warmth and atmospheric humidity, supplemented by spraying with Burgundy mixture.

Kaven (G.). **Schwarzbeinigkeit bei Stiefmütterchen.** [Blackleg in Pansies.]—*Blumen und Pflanzenbau verein. mit Gartenwelt*, xxxviii, 34, p. 433, 1934.

Pythium de Baryanum is stated to be a common agent of blackleg or root rot [damping-off] in pansies [*Viola tricolor*] in Germany [cf. *R.A.M.*, vi, p. 360]. The sole means of combating this disease is stated to be soil disinfection with 40 per cent. formaldehyde, applied at the rate of $\frac{1}{4}$ to $\frac{1}{2}$ l. in 100 l. water per sq. m. The soil should be covered for a week after treatment and before sowing the seed, and should not be dug after disinfection owing to the risk of bringing the fungus to the surface.

Dodge (B. O.). **Controlling the Hollyhock rust.**—*Journ. New York. Bot. Gard.*, xxxv, 416, pp. 186–189, 1 fig., 1934.

A brief, popular note is given on the life-history of hollyhock rust (*Puccinia malvacearum*) [*R.A.M.*, xii, p. 782; xiii, p. 306] and on its control by timely applications (in March or April, as soon as the young foliage appears) of a superior grade of dusting sulphur, e.g., pomogreen [ibid., xii, p. 25]. It is of the utmost importance to treat the seedlings at a very early age, when they are about 5 to 6 in. high, the outcome of fungicidal applications at a later stage of growth having been very disappointing in recent tests in New York. After flowering all the aerial parts of the plants should be destroyed to prevent infection of the new leaves developing in the late summer and autumn.

Noack (E.). **Fliederkrankheit und Fliederveredlung.** [Lilac disease and Lilac grafting.]—*Blumen und Pflanzenbau verein. mit Gartenwelt*, xxxviii, 33, pp. 420–421, 1934.

German phytopathologists are engaged on the investigation of an infectious lilac disease of which the cause so far remains obscure. On a visit to Holland the writer was impressed by the relative infrequency of the disease, which may possibly be attributed to the difference between Dutch and German grafting methods. In Holland it is the custom to graft high, inserting the scion 30 cm. up the stem, whereas in Germany low grafting is the rule. It is obvious that in the latter method the scion is exposed at the base to injuries during cultural operations as well as to softening of the tissues by rain. An attempt should at any rate be made to combat the infection by the means suggested.

LEVINE (M.). **Experimental production of crown gall on Opuntia.**—*Phytopath.*, xxiv, 8, pp. 929–937, 6 figs., 1934.

Of the several species of *Opuntia* inoculated with *Bacterium tumefaciens* following the isolation of the latter from the tree cactus (*Carnegiea gigantea*) in Arizona [*R.A.M.*, xii, p. 358], only one, *O. keyensis*, developed a walnut-sized crown gall in the course of a year. The others apparently lack the protective mechanism which leads to overgrowth formation in many dicotyledonous plants in response to the introduction of the tumour-producing organism.

OETTINGEN (H. v.). **Die Perlschnur- (Sklerotien-) Krankheit der Gräser.** [The 'string of pearls' (sclerotial) disease of grasses.]—*Nachricht. über Schädlingsbekämpf.*, ix, 2, pp. 86–89, 1934. [English, French, and Spanish summaries on pp. 106, 108, 111.]

Attention is drawn to the prevalence of *Sclerotinia* [*Sclerotium*] *rhizodes* [*R.A.M.*, xiii, p. 382] on *Phalaris arundinacea* during the recent succession of dry years in Germany, where it was first officially recorded in 1901. The damage is particularly severe on farms in the eastern plains, where the immense meadows that used to yield 30 to 40 zentner of hay per morgen [up to 3 tons per acre] are now scarcely worth mowing. It has been observed that the disease does not occur on areas subject to regular spring and winter flooding, and it is therefore recommended that where possible the ground water-level should be artificially raised and an appropriate fertilizer applied, the nature and quantity of which must depend on local conditions. By these means the yield may be increased by as much as a ton per acre. The popular name, 'string of pearls', proposed for the disease is suggested by the long rows of white, spherical sclerotia covering the leaves at an advanced stage of infection.

PAPE (H.). **Kleekrebsbekämpfung. Keine zu rasche Wiederkehr von Klee—Anbau von Kleegrasgemischen.** [Clover canker control. No over-hasty recurrence of clover—cultivation of Clover-grass mixtures.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xlix, 24, pp. 521–522, 2 figs., 1934.

Following up his previous investigations on clover canker (*Sclerotinia trifoliorum*) in Germany [*R.A.M.*, x, p. 669], the writer discusses the means of combating the disease, which is stated frequently to destroy 75 per cent. or even the whole of the crop. The sclerotia of the fungus have been found to persist for at least 4½ years in the soil in a viable state, so that a reasonably lengthy crop rotation is of considerable importance. Other precautions should include the use of seed of suitable origin (that from southern Europe not being adapted to German conditions); mixed cultivation of clover and grass, e.g., crimson clover [*Trifolium incarnatum*] or serradella [*Ornithopus sativus*] and Italian rye grass [*Lolium italicum*], Swedish [alsike] clover [*T. hybridum*] and timothy [*Phleum pratense*], and the like; invigoration of the stand by top-dressings of kainit and basic slag (up to March) and later of ammonia-superphosphate and potash salt; and deep ploughing-under of plant remains.

Goossens (J.). **Onderzoek naar de eerste infectiebron van Appel en Pereschurft.** [An investigation on the primary source of infection by Apple and Pear scab.]—*Tijdschr. over Plantenziekten*, xl, 8, pp. 174–176, 1934.

This is a preliminary note on the writer's investigations in Holland on the primary source of infection by apple and pear scab [*Venturia inaequalis* and *V. pirina*], which fully substantiated the observations of Dillon Weston and Petherbridge [*R.A.M.*, xiii, p. 245] that it is mainly from overwintered conidia, the role of the ascospores being evidently quite subordinate.

Horne (A. S.). **Biological work on fruit.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1933*, pp. 228–245, 2 pl., 6 graphs, 1934.

Further investigations confirmed the author's previous observation that penetration of apples by various fungi tested took place through the lenticels [*R.A.M.*, xiii, p. 106]. With a given population of Worcester Pearmain apples, of the fungi tested for power of overcoming external resistance the most active was *Phomopsis coneglanensis*, followed in descending order by *Penicillium expansum*, *Fusarium* [*lateritium* var.] *fructigenum*, *Botrytis cinerea* strain 8, *Sphaeropsis* sp. (New Zealand), *Monilia* [*Sclerotinia*] *fructigena*, and *Trichothecium roseum*. In a test of the effect of apple variety on penetration by five species of fungi, Worcester Pearmain and Bramley's Seedling apples showed, respectively, 91·7 and 37·9 per cent. successful penetrations.

When Worcester Pearmain and Bramley's Seedling apples, each from two plots, one of which had received balanced manurial treatment for ten years while the other had remained untreated, were inoculated with *F. lateritium* var. *fructigenum* D. and *Cytosporina ludibunda* C. E., respectively, and stored at laboratory temperatures, the Worcester Pearmain apples from the unmanured plot in two successive years showed more resistance than those from the manured plot, while with Bramley's Seedling apples the fruit from the unmanured plot was not consistently more resistant than that from the manured plot.

With Lane's Prince Albert apples, East Malling stocks X and VI [cf. ibid., xiii, p. 708] gave fruit, respectively, highly resistant and susceptible to the storage rot caused by *C. ludibunda*, though with Bramley's Seedling apples the reverse obtained.

Lindquist (J. C.). **Nota sobre la podredumbre amarga de la Manzana (Glomerella cingulata (St.) v. Schr. y Sp.).** [Note on the bitter rot of the Apple (*Glomerella cingulata* (St.) v. Schr. and Sp.).]—*Rev. Fac. Agron. Univ. Nac. La Plata*, xix, 3, pp. 398–406, 5 figs., 1933. [Received October, 1934.]

An account is given of the symptoms, mode of infection, and morphological and cultural characters of *Glomerella cingulata*, the agent of bitter rot of apples [*R.A.M.*, xiii, p. 523], which was first observed in the Argentine in 1929. Positive results were given by inoculation experiments with pure cultures (on potato-glucose agar) on oranges, peaches, cherries, pears, and quinces. Diseased material should be destroyed and preventive treatments of 2 per cent. Bordeaux mixture applied.

Brooks (C.) & Harley (C. P.). **Soft scald and soggy break-down of Apples.**—*Journ. Agric. Res.*, xlix, 1, pp. 55–69, 4 figs., 4 graphs, 1934.

The results of the experiments briefly described in this paper, which were conducted from 1930–3 in the State of Washington and in Virginia, indicated in agreement with those obtained by earlier investigators that soft scald and soggy [low temperature] breakdown of apples [*R.A.M.*, x, pp. 39, 115 and next abstract] are greatly increased by delayed storage, and that the extent of the increase usually varies with the length of the delay; it was further found that this factor also increases the resistance of the apples to remedial treatment. Soggy breakdown (but not soft scald) was somewhat reduced by gradual cooling of the fruit before placing in storage. The tests showed that the accumulated tendencies, whether resulting from delayed storage or whether inherent in the fruit at harvest, towards soft scald were largely removed by coating the fruit with a 50–50 oil-paraffin mixture, or by exposure for a short time before storing to partial vacuum, to high temperature (95° to 110° F.), or to carbon dioxide gas; the last-named treatment also checked the accumulated tendencies to soggy breakdown. Under the condition of the experiments this treatment favourably influenced the firmness of the fruit, without exerting an objectionable effect on its flavour and quality. It is believed, therefore, that it may serve as a basis for commercial control of both conditions where it is desired to hold the apples at the usual cold storage temperature of 32° F. [cf. ibid., xii, p. 102].

Kidd (F.) & West (C.). **The cause of low temperature breakdown in Apples.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1933*, pp. 57–60, 2 graphs, 1934.

After pointing out that the development of low-temperature breakdown [see preceding abstract] in apples in cold storage depends not on temperature alone, but also on the stage of maturity reached by the fruit when placed in storage [*R.A.M.*, viii, p. 253], the authors describe an experiment in which large numbers of Bramley's Seedling apples were, after gathering, stored at 50° F. and removed to 34° at successive intervals, the carbon dioxide production of one sample being followed at 50° from the time of gathering onwards. The results obtained [which are expressed graphically] showed that the fleshy tissues broke down sooner when the fruit was placed in cold storage at the peak of the climacteric rise in respiratory activity than when it was so stored before or after this stage. A further test, in which the apples were stored from the outset at 34° and individual samples were transferred to 50° at successive intervals, indicated that prolonged exposure to low temperatures may decrease liability to fungal rotting, either because fruit with incipient breakdown becomes less susceptible to rotting by fungi or because the fungal activity is reduced by long exposure to low temperatures. In both experiments, breakdown and fungal wastage were as a rule mutually exclusive in the same apple.

Kidd (F.) & West (C.). **The control of superficial scald of Apples.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1933*, pp. 199–204, 1934.

In an experiment conducted to ascertain the influence of the rate at which water is lost upon the development of scald [*R.A.M.*, xiii, p. 108] on Newton Wonder apples, strictly comparable samples were stored in a single layer unwrapped at 37·5° F. in a small wind-channel apparatus receiving air at average relative humidities of 89·7, 95·7, and 97·6 per cent. of saturation on entry, the rate of air movement being 2·3 cm. per minute. After 109 days, much less scald was present on the apples from the driest atmosphere than on those from the more humid ones.

When various types of wrapping papers in 10 in. square sheets were tested, the only quality which appeared significantly to influence the development of a late browning of the skin on Belle de Boskoop apples (typical scald did not develop in this test) was weight, heavy papers with or without oil giving better control of the skin browning than did light papers. In a test of the effect of the quality of the oil used no significant difference was observed between highly refined oils from viscosity 820 to 135 seconds; these controlled skin browning when the amount used was 0·06 gm. per sheet; with 0·12 gm. rather less control resulted. When less refined oils were used, 0·06 gm. gave slight, and 0·12 gm. no, control.

Kidd (F.). & West (C.). **The effect of root-stock on the keeping quality of Bramley's Seedling Apples.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1933*, pp. 204–205, 1934.

When Bramley's Seedling apples from 15-year-old trees worked on East Malling rootstocks [see above, p. 40] types IX (dwarfing), II (semi-dwarfing), I (semi-vigorous), and XVI (vigorous) were stored at 34° F. the commercial storage life of the apples from the different root-stocks was, respectively, 20, 14, 20, and 21 weeks, after which wastage was almost entirely due to low-temperature breakdown, fungal attack being negligible.

Barthelet (J.). **Sur une pourriture des Poires due à un champignon Discomycète Phacidiella discolor (Mont. et Sacc.) Poteb.** [On a Pear rot due to a Discomycetous fungus *Phacidiella discolor* (Mont. et Sacc.) Poteb.]—*Ann. des Epiphyties*, xix, 6, pp. 357–368, 3 pl., 8 figs., 1933. [Received November, 1934.]

This is an extended account of the writer's studies on the pear rot caused by *Phacidiella discolor* in France, the essential points of which have already been summarized from another source [*R.A.M.*, xiii, p. 585].

Malherbe (I. de V.). **Little leaf or rosette of fruit-trees.**—*Farming in South Africa*, ix, 101, pp. 312–313, 315, 2 figs., 1934.

Little leaf or rosette of fruit trees [*R.A.M.*, v, p. 167] is stated to occur in practically every orchard district in the western Cape Province, South Africa, apricot, plum, apple, and pear all being affected, while in Klein Drakenstein a mottle leaf, apparently of the same type as that described from America on deciduous fruit trees [ibid., xii, p. 434; xiii, p. 692],

has been observed on orange and mandarin. In a Banhoek orchard it was noted that plum trees grafted on Marianna rootstocks were practically free from the disorder in a low-lying orchard, whereas those on yellow peach growing beside the former were seriously affected. Good results have been obtained by the application to the soil round four-year-old plum trees just before blossoming of 4 or 5 lb. of zinc sulphate [ibid., xiii, p. 39] and of 5 or 8 lb. round older trees. The preparation costs about 3d. per lb.

Fish (S.). **Brown rot control.**—*Fruit World of Australasia*, xxxv, 7, pp. 367–368, 1934.

Tests conducted since 1926 in Victoria conclusively demonstrated the importance in the control of brown rot of stone fruits [*Sclerotinia fructicola*: *R.A.M.*, xiii, p. 110] of destroying all mummified fruits and infected wood before applying dormant sprays. Sodium orthodinitrocresol gave promising results in preventing sporulation on infected twigs overlooked in pruning, and was toxic to aphid eggs.

On injured peaches infection develops during pre-cooling and in ice-trucking in Sydney; peaches sound when arriving at the market, but dispatched from heavily infected orchards readily develop brown rot when exposed to the temperatures of the market. Under the temperature and moisture conditions prevailing at the agents' stands peaches with a heavy spore load on the skin develop the disease in less than the five days required by the dealers for distribution and consumption.

Control measures tentatively recommended for peaches are as follows: (1) remove every mummified fruit from the trees before applying any dormant spray; (2) when burning pruned infected wood also destroy as many mummies found on the ground as possible; (3) plough the ground after pruning and before applying dormant sprays; (4) until more information is available concerning the new spray mentioned above apply lime-sulphur 1 in 10 in the late dormant period and self-boiled lime-sulphur or a convenient substitute at petal-fall, when the fruit is half-grown, and one month before picking. An application of Bordeaux mixture 12–8–80 should be made after pruning and again at the late pink bud stage. Fruit cover sprays cannot be applied to apricots without injury.

Pear black spot [scab: *Venturia pirina*: ibid., xii, p. 296] may be controlled by applying Bordeaux mixture 12–8–80 just after the young folded leaves protrude from the bud, again when they have separated from the unopened blossom bud, and at half this strength about three weeks after the fruit has set. Lead arsenate may be added after the Bordeaux mixture has been made. Under Goulburn Valley conditions a modified schedule would probably be effective, consisting of a full-strength application at the white bud stage and one at half-strength three weeks after setting.

Koch (L. W.). **Studies on the overwintering of certain fungi parasitic and saprophytic on fruit trees.**—*Canadian Journ. of Res.*, xi, 2, pp. 190–206, 3 pl., 1 fig., 1934.

Evidence is given from experiments in Ontario to show that the conidia of the black knot fungus (*Dibotryon morbosum*) [*R.A.M.*, xii, p. 704]

can survive the winter in a viable condition on plum and cherry. The fungus was further isolated repeatedly during the winter from chlamydospores on plum buds and bark. In pure cultures on potato-dextrose agar chlamydospore production by *D. morbosum* occurred only in proximity to certain bacteria and *Cephalothecium* [*Trichothecium*] *roseum* [cf. ibid., xii, p. 109] or on the introduction into the Petri dishes of a drop of sulphuric acid or copper sulphate. Chlamydospore formation was also induced on plum twigs by the germination of black knot conidia in close association with a strain of bacteria originally isolated from the same host.

Cladosporium carpophilum was several times isolated from chlamydospores on the bark of Late Crawford peaches. Chlamydospores were also produced in culture and on twigs; a histological study of the latter revealed the presence of two types of lesion, namely, primary ones formed by early infections during the summer and secondary extensions made in the following winter by the migration of the mycelium beyond the barriers of periderm delimiting the primary lesions [cf. ibid., xiii, p. 37]. Late infections, on the other hand, rarely induced periderm formation and were not succeeded by secondary winter spread. *Taphrina deformans* was isolated during the winter from the surface of peach buds and its viability conclusively demonstrated by inoculation experiments [ibid., xiii, p. 452].

A species of *Coniothyrium* was frequently isolated during the winter from chlamydospores from the buds and bark of plum, peach, cherry, apple, pear, and *Prunus pennsylvanica*. Chlamydospores were further produced in culture by various other organisms on plum, cherry, and related hosts, e.g., *Torula*, *Cladosporium*, *Hormodendrum*, and *Fumago* spp. All the foregoing evidence points to the generally unrealized importance of chlamydospores in the perpetuation of various groups of fungi and emphasizes the need for the fungicidal treatment of fruit trees during the dormant period.

BODINE (E. W.). **Occurrence of Peach mosaic in Colorado.**—*Plant Disease Reporter*, xviii, 10, p. 123, 1934. [Mimeographed.]

A severe outbreak of peach mosaic, first recorded from Texas [*R.A.M.*, xii, p. 37], is reported from Mesa County, Colorado, where some of the orchards contain up to 100 per cent. infected trees. Eradication work is in progress.

PARHAM (B. E. V.). **Annual Report on Banana Disease Investigations, 1933.**—16 pp., [Fiji], 1934.

During the last twenty years the most virulent banana disease in Fiji, restricting the growth and preventing the proper maturation of the fruit, has been 'sigatoka' disease or leaf spot (*Cercospora musae*) [*R.A.M.*, xii, p. 456; xiii, p. 112, and next abstract]. Since 1931 infection has spread, and is now very widely distributed, constituting a serious menace to growers. In 1932 about 40 per cent. of the fruit destined for export was rejected at the packing stations owing to the disease, equivalent to a loss of £60,000.

The disease was present in every area inspected, in many localities to a marked degree, even in comparatively recent plantations; as a rule,

in the older ones all the plants were affected. The areas at present occupied by plantations rendered unproductive as a result of infection are probably as extensive as those that are still producing marketable fruit. This represents an annual loss of potential crop valued at £90,000.

During their entire life affected plants show a continuous, abnormal destruction of leaves, and when the bunch is produced there is a rapid failure of the final leaves which results in almost complete defoliation of the plant before the fruit has reached maturity. The bunch either fails to develop normally, or if it reaches the three-quarter stage, individual fruits begin to ripen prematurely, and on being broken across, the green fruit shows characteristic discoloration and other symptoms. This abnormal ripening is associated with a rapid collapse and decay of the main stalk and the early development of cushion and finger rots. The application of vaseline to the cut stalk ends failed to prevent this condition.

The root systems of infected plants are greatly reduced, and those roots left are very unhealthy. The dead and decaying leaf bases are frequently subject to bacterial rots and to attack by *Marasmius* sp. which is found on the plant from ground-level upwards, killing the leaf bases and also affecting the pseudostem [cf. ibid., xiii, p. 251].

No differences in varietal resistance were observed among susceptible plants, Veimama and Cavendish bananas [*Musa cavendishii*] being about equally affected, but Blue Java, Lady's Finger, and certain plantain [*M. paradisiaca*] varieties show marked immunity. Under the prevailing conditions not even a single ratoon crop can be expected with certainty from susceptible varieties in any but the best soils.

The available evidence gives further support to the view that no direct correlation exists between the degree of leaf spot infection and the incidence of *Cosmopolites sordidus* borers.

Susceptibility is closely correlated with the water relations of the roots as they affect turgidity. Infection is favoured particularly by lack of water brought about by drought or by the death of the rootlets and root hairs as a result of waterlogging or other causes.

On one occasion Cavendish plants from which the fruit had been cut were found almost defoliated by diamond spot (*Scolecotrichum musae*) [ibid., xiii, p. 787] and rust (*Uromyces musae*), but except for two overmature bunches all the fruit from these plants was free from the symptoms associated with leaf spot and was accepted by the packers.

Spraying from May to December, consistent large-scale stripping, and manuring all have failed to control leaf spot.

Bunchy top [ibid., xiii, p. 642] was responsible for the poor condition of many banana plants, particularly those of the Cavendish variety.

WARDLAW (C. W.). **Banana diseases. IX. The occurrence of Sigatoka disease (Cercospora musae Zimm.) on Bananas in Trinidad.**—*Trop. Agriculture*, xi, 7, pp. 173–175, 2 pl., 1934.

The author reports the recent discovery of the banana leaf spot caused by *Cercospora musae* [see preceding abstract] on the Governor (Dwarf Cavendish) and Giant Governor [*Musa cavendishii*] varieties in the Maqueripe district of Trinidad, where the disease was also observed on the Gros Michel and Bande varieties. This is stated to be the first record

in the Western tropics of the fungus, the identity of which with the organism occurring in Queensland and in Fiji was confirmed by the Imperial Mycological Institute. Although restricted to one locality alone in Trinidad, the intensity of the spotting on the two Governor varieties and the destruction of the leaf tissue are sufficient indications of the potentialities of the outbreak, and steps have been taken for its eradication in the light of control measures recommended by other workers, a brief summary of which is given. All infected leaves are being stripped and burned together with all banana leaf debris on the ground.

West (E.). **Anthracnose of Mango.**—*Florida Agric. Exper. Stat. Press Bull.* 463, 2 pp., 1934.

A popular note is given on the symptoms of mango anthracnose (*Colletotrichum gloeosporioides*) [*Glomerella cingulata*: *R.A.M.*, xii, p. 521], which is stated to be a limiting factor in production in rainy or foggy seasons. Control presents considerable difficulties owing to the abundance of infective material, especially on the highly susceptible flower clusters which are most in need of protection. The treatment recommended consists of eight applications of 3–3–50 Bordeaux mixture plus calcium caseinate, beginning as the flower buds swell and extending at lengthening intervals of 4 to 21 days over a period of some three months.

West (E.). **Papaya leaf spot.**—*Florida Agric. Exper. Stat. Press Bull.* 462, 2 pp., 1934.

A serious disease of papaws in Florida, where this crop is stated to be gaining in importance, is the leaf spot caused by *Pucciniopsis* [*Asperisporium*] *caricae* [*R.A.M.*, ix, p. 230], which produces pale or yellowish spots covered on the under side with the minute, raised, brownish-black fructifications of the fungus, often arranged concentrically. In severe cases defoliation may ensue, with adverse effects on the size, quality, and yield of the fruit. Control may be readily effected by the destruction of infected material and weekly applications of 3–3–50 Bordeaux mixture plus calcium caseinate, beginning with the expansion of the leaf blades and continuing for at least six weeks.

Thompson (A.). **A disease of the Durian tree.**—*Malayan Agric. Journ.*, xxii, 8, pp. 369–371, 1934.

Durian (*Durio zibethinus*) trees in Penang for about ten years have been observed to be liable to develop claret-coloured bark cankers. There is no external indication of a fungus in the bark until a dark exudate appears from one or more spots on the trunk, sometimes near or at the collar. Boring beetles attack the bark at these spots. Dull red areas bounded by an irregular margin are formed, extending inwards as far as the wood of the stem. The canker spots become larger and may coalesce, until a considerable portion of the bark is killed and becomes riddled with the holes of boring beetles. A tree may not die until a year after infection has occurred.

From the cortex of a diseased tree *Phytophthora palmivora* was isolated, inoculations with which reproduced the early stage of the condition in seven days, the fungus being reisolated from the infected material.

As the disease is likely to spread to rubber adjoining the durian trees and vice versa, growers should inspect their trees periodically, remove and burn any diseased bark, and disinfect the wounds.

Goryaïnoff (A.). Острое оружие химии на защиту урожая.—[Chemistry as a keen weapon in crop protection.]—*На Защиту Урожая* [*Crop Protection*], *1934*, Moscow, pp. 5–7, 1934.

In this brief paper the author mentions the considerable advance made since 1930 in chemical industries in U.S.S.R., and particularly in the home production of new fungicides and insecticides, and also of foreign patented preparations, e.g., kupfer-meritol against downy mildew [*Plasmopara viticola*] and insect pests of the vine, germisan, uspulun, &c., the formulae of which have been determined. Up to that year the Union was practically entirely dependent on foreign countries in regard to most of the important chemicals used in plant protection, the importation of which from 1922 to 1926, inclusive, amounted to 3,800,000 gold roubles [£380,000], while at the present time their importation is claimed to have been reduced to a minimum, and a start is said to have been made in the export to foreign countries of a few of the home preparations. Among the new fungicides locally manufactured, mention is made of the placing on the market in 1931 of AB dust [*R.A.M.*, xii, p. 617] for cereal seed-grain disinfection against smuts, superseded in 1932 by Davydoff's preparation, in which copper carbonate is replaced by an arsenical salt [see above, p. 22]; at the present time the testing has been completed of a further cereal seed disinfectant, containing much less arsenic, in the form of organic arsenic, and called talc-arsin [loc. cit.], which was shown to be fully as effective as the former. A new preparation termed 'ultra-sulphur' is claimed to be effective against certain cotton and vine diseases [not specified] and to contain one-tenth of the sulphur in the common pure sulphur dusts, while the quantity required of each is the same for the same areas treated. Finally, attempts are now being made to find a substitute for copper among the by-products derived from the calcination of sulphurous pyrites.

Nikiforoff (A.). Техническое перевооружение системы ОБВ.—[Technical rearmament of the OBV system.]—*На Защиту Урожая* [*Crop Protection*], *1934*, Moscow, 1, pp. 9–11, 7 figs., 1934.

This is a brief enumeration of some new apparatus for the control of parasitic diseases of plants, which have been introduced in the U.S.S.R. since the initiation in 1930 of the OBV system (Pan-Soviet Association for the control of injurious agents in Agriculture and Silviculture). The first large-scale apparatus ABV–1 constructed in 1930 by G. I. Korotkikh and S. D. Popoff and capable of disinfecting up to 12 tons per hour of cereal seed-grain, was superseded in 1933 by three types of apparatus of Popoff's construction, one of which combines the dust, semi-dry, and liquid treatments, and is capable of treating up to 10 tons of seed per hour by the dusting, and up to 5 tons by the semi-dry, method. Its distinctive feature is that it is almost entirely constructed of wood, and that the disinfectant dust or liquid is fed into the machine automatically. Still another seed-disinfecting machine of smaller capacity (2 to 3 tons

per hour) has been devised by Professor Borghardt, and is now being tested for practical performance. Under trial is also a machine constructed by Mikhailoff-Sienkewicz, Popoff, and Stepanoff, for the treatment with sulphuric acid of cotton seed.

In 1933 the 'Vulcan' Mechanical Works constructed the first Russian horse-driven dusting apparatus and a horse-driven spraying machine. In 1932 Sneigour constructed the first large-volume automatic sprayer, brand S, and in 1933 the Gorkovsky Automobile Works devised a powerful sprayer which is mounted on a 1·5 ton lorry and is capable of spraying an area of 60 hectares per working day. The same works have also devised a sprayer of the Rochester type, which is attached to a tractor and is worked by a power take-off from the latter; the machine is designed to spray orchard trees, and gives a spray column up to 12 m. in height and from 1 to 1·5 m. in diameter; and also a combined orchard and field tractor-sprayer with a tank of 800 l. capacity, working under a pressure of 25 atmospheres. Mention is also made of some further improved models of dusting and spraying machines now under construction or trial.

KISSER (J.) & PORTHEIM (L.). **Versuche über die Verwendbarkeit von Wasserstoffsuperoxyd als Saatgutbeizmittel.** [Experiments on the use of hydrogen peroxide as a seed disinfectant.]—*Phytopath. Zeitschr.*, vii, 4, pp. 409–426, 1934.

Promising results have been obtained in laboratory experiments [details of which are given] in Vienna in the disinfection of vegetable, cereal, and ornamental seeds by quantities ranging from 2 to 32 per cent. of the weight of the seed of commercial solutions containing 15, 20, or 30 per cent. hydrogen peroxide [cf. *R.A.M.*, xi, p. 483].

The larger quantities of disinfectant were used for rough or otherwise disinfection-resistant seeds such as beet seed clusters, and the smaller quantities for smooth seeds (peas, beans, *Brassicae*, and the like). For the cereals intermediate quantities were used. In many cases complete disinfection was secured without injury to the seeds; of the cereals tested, barley and oats were much less susceptible to damage than rye and wheat, but they were not completely disinfected by any of the concentrations used. Rye is also difficult to disinfect completely by this means, but wheat was better. One drop of a spore suspension of *Tilletia tritici* [*T. caries*] was placed for 20 minutes in ten drops of 1, 5, 10, 20, or 30 per cent. hydrogen peroxide, thoroughly washed, and sown on agar moistened with a dilute solution of calcium nitrate. The spores treated with the three highest concentrations of the peroxide were killed and those exposed to the disinfectant at 5 per cent. partially inactivated, while the minimum strength was ineffective. Wheat seed-grain heavily infested with *T. caries* spores and immersed for 3 hours in 6 or 12 per cent. by weight of a solution of 30 or 15 per cent. H_2O_2, respectively, was completely freed from infection, which occurred abundantly, on the other hand, in a control series steeped in pure water. The pulses and maize were relatively easy to disinfect but the *Brassicae* were uncertain and rough seeds like those of tomato and cucurbits required large quantities of solution. Beet seeds were not fully disinfected by any of the treatments.

Grochowska (Zofja). **Wpływ środków grzybobójczych na kiełkowanie zarodników szarej pleśni Cebuli, Botrytis allii Munn.** [Effect of fungicides on the germination of the conidia of Onion grey rot, *Botrytis allii* Munn.]—*Wydawnictwa Skoly Glownej Gospod. Wiejsk. w Warszawie* [*Trans. Chief School of Agric. in Warsaw*], i, pp. 101–119, 1934. [English summary.]

A brief account is given of preliminary experiments on the effect on the germination of the conidia of *Botrytis allii* [*R.A.M.*, xii, p. 610] of soap, copper sulphate, Burgundy mixture, lime-sulphur, and solbar. The results showed that the conidia were much more resistant to the action of the fungicides in nutrient solution hanging drops than in nutrient agar cultures. Of the substances and concentrations tested, 1 per cent. soap emulsions alone almost completely inhibited the germination of the conidia in hanging drops. In agar cultures the germination was completely suppressed by a 0·5 per cent. copper sulphate solution, while in hanging drops a 10 per cent. solution was not sufficient to kill all the spores. All the other fungicides tried were shown to be of considerably lesser efficacy.

Săvulescu (T.). **Pflanzenschutz und phytopathologische Organisation in Rumänien.** [Plant protection and phytopathological organization in Rumania.]—Issued by *Min. für Landwirtsch. u. Domänen Landwirtsch. Forsch.-Inst. von Rumänien,* 57 pp., 11 figs., 1 graph, 1394.

An account is given of the organization of the Rumanian phytopathological service, which was established in 1927 and is divided into three sections: one at Bucharest (headquarters), an entomological branch, and the phytopathological station of Bessarabia at Chisinău. Affiliated research centres include four phytopathological laboratories belonging, respectively, to the Silvicultural Research Institute, the Plant Breeding Station at Cluj, the Tobacco-Growing and Fermentation Institute, Bucharest-Baneasa, and the Head Agricultural Chamber, besides two local advisory stations for vine mildew [*Plasmopara viticola*] control.

The plant protection service, dating only from 1st April 1933, has already taken in hand the eradication of the barberry with a view to the control of *Puccinia graminis*, which was responsible for heavy damage in 1932 and 1933 [*R.A.M.*, xii, p. 426; xiii, p. 152], besides organizing a mass campaign for the spraying of fruit trees.

The text of the Rumanian phytosanitary legislative measures from 1868 onwards is given, and an appendix contains a list of Rumanian and foreign disinfectants of proved utility.

Christoff (A.). Способъ за хващане на разнасянитѣ чрезъ вѣтъра спори. [Apparatus for catching wind-borne spores.]—*Journ. Agric. Exper. Stations in Bulgaria,* Sofia, vi, 3–4, pp. 41–48, 1 diag., 1934. [English summary.]

A summarized account is given of the construction and use of a spore-catching apparatus devised by the author for the special purpose of determining the date of the first appearance in the air each year of

the spores of particular plant pathogens. The apparatus was tested during the spring of 1933 in orchards in Bulgaria, and is claimed to have given excellent results in detecting the first spores to appear of *Monilia* [*Sclerotinia*] *cinerea*, *Clasterosporium carpophilum*, *Polystigma rubrum* [*R.A.M.*, xiii, p. 453], and *Venturia inaequalis* (ascospores and conidia).

Petersen (H. E.). **Wasting disease of Eelgrass (Zostera marina).**—*Nature*, cxxxiv, 3378, pp. 143–144, 1934.

The destruction of eelgrass (*Zostera marina*) from wasting disease in Danish waters in the summer of 1933 [*R.A.M.*, xiii, p. 793] continued during the following winter, but the young leaves formed in the spring were generally healthy, infection reappearing in the early part of the summer. In June, 1934 organs (apparently perithecia) producing long spores were found in *Zostera* rhizomes in the northern Kattegat, and it is evidently to these that fresh infections are due. It seems probable, from the high incidence of the fungus in Danish waters, associated in places with the virtual extinction of the eelgrass, that the fungus is the cause of the wasting disease.

The systematic position of the organism is still obscure. The spores are long, flexible, and reminiscent in shape of those of *Ophiobolus* [ibid., xiii, p. 716]; they do not, however, appear to fall into fragments, while the ascus walls undergo very early dissolution. If the Danish fungus is identical with *O. maritimus* Sacc. [see next abstract] the species should be transferred to another genus.

Tutin (T. G.). **The fungus on Zostera marina.**—*Nature*, cxxxiv, 3389, p. 573, 1934.

Ophiobolus halimus Diehl et Mounce, recently described as occurring on *Zostera marina* on the Atlantic coast of North America [*R.A.M.*, xiii, p. 716], has been found during the summer of 1934 in several localities of Devon, the north coast of Guernsey, and Lough Ine, Ireland [loc. cit.]. A recent comparison by E. J. Butler of the British and North American material has established the identity of the fungus in both lots of specimens.

It was at first thought that the organism under observation might be *O. maritimus* recorded on the same host by Saccardo [see preceding abstract], but a re-examination by Prof. E. Ulbrich of the type specimen in Berlin showed that the leaf on which this fungus occurred belonged to a grass, probably *Elymus*, but certainly not *Zostera*. This identification was later confirmed by examination of the type lent to the Kew Herbarium. An error on Saccardo's part, due perhaps to a misunderstanding of the statement on the cover by P. Magnus, who collected the specimen, that it was 'unter *Zostera*', has been responsible for the incorrect record of *O. maritimus* on the grass-wrack seaweed. Assuming that *O. halimus* is also the organism under investigation by H. E. Petersen, its known distribution is parts of the Atlantic coast of North America, south-west England, Channel Islands, and Denmark. Experiments on the pathogenicity of *O. halimus* are in progress at the Marine Biological Association's laboratory at Plymouth.

Otero (J. I.) & Cook (M. T.). **Partial bibliography of virus diseases of plants.**—*Journ. Agric. Univ. Puerto Rico* (formerly *Journ. Dept. Agric. Puerto Rico*), xviii, 1–2, pp. 5–410, 1934.

This valuable compilation contains a large number of titles of the more important contributions to the subject of virus diseases in plants [*R.A.M.*, xiii, p. 530], accompanied in many cases by a brief indication of the scope of the work. No claim to completeness is made and the writers would welcome additional material and corrections for inclusion in a forthcoming supplement, all correspondence to be directed to the junior author.

Drake (C. J.), Martin (J. N.), & Tate (H. D.). **A suggested relationship between the protoplastic bridges and virus diseases in plants.**—*Science*, N.S., lxxx, 2067, p. 146, 1934.

The onion yellow dwarf virus [*R.A.M.*, xiii, p. 146] is stated to have been transferred from diseased to healthy plants in Iowa by over 75 species of aphids. In tracing the course of the stylets of the aphid's beak it was occasionally observed, e.g., in *Myzus persicae* and *Aphis rumicis*, that the content of a cell adjacent to the intercellular path of the stylet appeared to have been partially extracted without any puncture of the walls. Protoplasmic bridges (plasmodesms) between adjacent cells in the onion were from a few to 60 μ or more in diameter. Even in regions where the plasmodesms were few, the aphid stylets traversing the middle lamella intercellularly could scarcely avoid contact with them. The insect would thus be able to inoculate the cell content without puncturing the wall.

Sheffield (F[rances] M. L.). **Experiments bearing on the nature of intracellular inclusions in plant virus diseases.**—*Ann. of Appl. Biol.*, xxi, 3, pp. 430–453, 3 pl., 1934.

The author describes the intracellular changes occurring in Solanaceous plants affected with tomato aucuba mosaic virus and the disease caused by Hy III virus [*R.A.M.*, xii, pp. 243, 526], and compares them with the cytological effects of tobacco mosaic. In plants affected with the two former viruses inclusion bodies are formed by the aggregation and fusion of minute particles in the cytoplasmic stream, whereas with tobacco mosaic an amoeba-like X-body is produced and after some weeks suddenly disappears; it is accompanied by striate material which ultimately fuses into one large body.

In attempts to reproduce these conditions in healthy cells of Solanaceous plants by means of coagulating agents almost all the reagents used induced a stimulation of the cytoplasmic stream similar to the initial sign of virus infection. All the cytological abnormalities due to aucuba mosaic or Hy III virus were reproduced with salts of molybdic acid [ibid., xii, p. 526], while lactic acid induced the formation of bodies resembling the X-bodies of tobacco mosaic but persisting only for a few hours.

Efforts to inhibit the formation of the inclusion bodies in virus-diseased plants by treatment with various chemicals gave negative results.

The results of these experiments support the view that the intracellular inclusions of plant virus diseases are essentially products of the host cell.

A bibliography of 20 titles is appended.

Kuprewicz (V. F.). К физиологии больного растения. Физиологические данные о вредоносности некоторых грибных и вирусных болезней культивируемых растений. [Contribution to the physiology of diseased plants. Physiological data on the injury caused to cultivated plants by some fungus and virus diseases.]—*Thesis Acad. of Sciences U.S.S.R., Bot. Inst.*, Leningrad, 71 pp., 1 fig., 10 graphs, 1934. [English summary.]

A comprehensive report is given of the author's investigations of the changes caused in the normal physiological processes of healthy plants under the influence of certain fungal and virus diseases, the material studied consisting of *Cirsium arvense* infected with *Puccinia suaveolens*, Victoria field peas infected with *Mycosphaerella pinodes*, *Trifolium hybridum* infected with *Erysiphe communis*, and potato affected with mosaic, aucuba mosaic, and leaf roll. Basing his conclusions on the mass of experimental data obtained, he states that such changes consist in general of a decrease in the chlorophyll content and in the energy of photosynthesis (the latter in cases of sharply expressed disease symptoms), increased or decreased intensity of respiration, retarded translocation of assimilates, increased transpiration, disturbed osmotic pressure in the infected tissues, and a decrease in the accumulated organic matter. A bibliography of 159 titles is appended.

May (O. E.) & Herrick (H. T.). **Some practical and theoretical aspects of mold metabolism.**—*Journ. of Bact.*, xxviii, 2, pp. 145–151, 1934.

A brief review is given of some outstanding researches on the production by moulds of chemical products of commercial utility, namely, citric, gluconic, kojic, and gallic acids and industrial alcohol [cf. *R.A.M.*, x, p. 46; xi, p. 119 *et passim*].

Pohjakallio (O.). **Significance of different sugars as nutrient media for some rusts.**—*Suomen Maataloustieteelisen Seuran Julkaisuja*, xxv, pp. 1–94, 1932. [Finnish, with German summary in original. Abs. in *Biol. Abstracts*, viii, 7, p. 1650, 1934.]

Cut stems of *Festuca pratensis* naturally infected by rust (*Puccinia* sp.) and placed with their bases immersed in glucose, fructose, saccharose, and maltose solutions developed many more and larger uredosori than the controls in water [cf. *R.A.M.*, ii, pp. 13, 361]. In another series of tests, portions of leaves of *F. pratensis*, *F. rubra*, *Poa pratensis*, oats, and wheat were removed after natural infection but before the appearance of sori, and it was found that all the rusts sporulated much more profusely when the leaves were then placed in sugar solutions, especially at a relatively low concentration (2 per cent.), than when placed in water. Electrometric acidity determinations showed in most of the tests an intense acidification of the solutions, apparently leading to hydrolysis of the disaccharides.

Half of a *F. pratensis* plant was protected from the light and after

four days' exposure of the other half to daylight it was found that portions of leaf from the covered part produced many more spores in sugar solutions than in water. The sori produced on the foliage in water were much smaller in the part kept in darkness than in light, whereas in a glucose solution no difference was observed. After six days during which half of each plant was covered, the rust sori were only half as large on the covered leaves and new ones developed only on foliage exposed to the light. A Danish variety of *F. pratensis* showing a high degree of resistance in plot trials developed small sori in a 4 per cent. glucose solution in fourteen days but none in water.

Phragmites communis, *Calamagrostis epigea*, *F. pratensis*, and oats were inoculated with aecidiospores of *P. phragmitis* [ibid., vi, p. 336], *P. coronata calamagrostis*, *P. coronifera festucae*, and *P. coronifera avenae* [*P. lolii*: cf. ibid., xii, pp. 274, 364]. Five to seven days later noticeable colour changes were shown by the leaves in both water and sugar solutions and penetration occurred with equal facility in both. Sporulation, however, was much more abundant in sugar than in water. Sori were formed in every place where the colour had changed but were very small on the leaves in water and developed a day later than in sugar.

The sugar content of *F. pratensis* leaves in the late summer (the period of rust attack) was found to be higher than in the early part of the season when the disease is absent. All the four varieties of *F. pratensis* used in the tests are more liable to infection with an increase in their sugar content.

HAENSELER (C. M.). **Beneficial fungi.**—*N*[*ew*] *J*[*ersey*] *Agric.*, xvi, 2, pp. 6–7, 1934. [Abs. in *Exper. Stat. Rec.*, lxxi, 3, p. 331, 1934.]

Experiments still in progress are stated to have shown the antagonistic action of a species of *Trichoderma* towards the damping-off fungi *Rhizoctonia* and *Pythium* when a culture of the former was added to cucumber seed-beds contaminated by either of the latter [*R.A.M.*, xi, p. 350; cf. also xiii, p. 391]. The *Trichoderma* was found to produce a substance directly toxic to *Rhizoctonia*, which is destroyed by ten minutes' exposure to a temperature of 80° C., ten days' ageing, and five minutes in an atmosphere of pure oxygen.

PIESCHEL (E.). **Ueber eine weisssporige Uredoform eines Rostpilzes und über die Entstehung zusammengesetzter Uredopusteln.** [On a white-spored uredo form of a rust fungus and on the origin of composite uredo pustules.]—*Phytopath. Zeitschr.*, vii, 4, pp. 393–398, 6 figs., 1 diag., 1934.

In the autumn of 1931 a white-spored uredo form of *Melampsora euphorbiae* f. sp. *pepli* (*M. helioscopiae* f. sp. *pepli*) [*R.A.M.*, ix, p. 601] was found on *Euphorbia peplus* in a restricted area of south Hanover. The uredosori were pure white and the spores, paraphyses, and germ-tubes hyaline, so that the orange pigment typical of the normal uredo stage of the rust was evidently absent. The albino strain, which showed a reduced germinative capacity as compared with the normal, maintained its character in greenhouse cultures on the host covering a period of two years, and it was further disseminated by field inoculations over a radius of 40 to 60 m. from the place of origin. The white-spored

form was particularly virulent towards *E. peplus* plants from the district in which it was discovered and the surrounding country, a high degree of resistance being shown, on the other hand, by specimens from Brunswick. Composite uredo pustules, from which both yellow and white spores developed, were obtained by mixed inoculations with the normal and albino forms.

FOLSOM (D.). **Potato virous diseases in 1933.**—*Amer. Potato Journ.*, xi, 9, pp. 235–242, 1934.

A bibliography is given of recent American and European literature (1932–3) on potato virus diseases, comprising 133 titles, on the lines of the compiler's previous surveys [*R.A.M.*, xiii, p. 257].

MORGENTHALER (O.). **Die Blattrollkrankheit der Kartoffel, eine Infektion oder eine Ernährungsstörung?** [Leaf roll disease of the Potato, an infection or a nutritional disturbance?]—*Mitt. Naturforsch. Gesellsch. Bern, 1933*, pp. xxxxiv–xxxxv, 1934.

The history of potato leaf roll during the last thirty years or so may be divided into three sections, the first comprising the early years of the present century up to the outbreak of the world war, during which an attempt was made to determine the nature of the disease and to work out measures for its control; the second, beginning during the war, was marked by the application of virus theories to the problem; while the third, embracing the last six or seven years, has seen the development of the ecological hypothesis of degeneration [see next abstract]. All these modes of approach to the question have proved fruitful in different ways; their outcome is briefly summarized in the light of contemporary studies [to which reference has been made from time to time in this *Review*].

KLAPP (E.) & SPENNEMANN (F.). **Strichelkrankheit und Scheinabbau der Kartoffel. Versuch der Analyse eines Falls schwerer, fortschreitender Wuchsstörungen.** [Streak disease and pseudo-degeneration of the Potato. An attempted analysis of a case of severe, progressive growth disturbances.]—*Pflanzenbau*, xi, 2, pp. 67–78, 6 figs., 1934.

Full details are given of an investigation, covering the period from 1930–3, of certain cases of absolute failure of the Industrie and Edeltraut potato varieties near Darmstadt (Hesse). From a consideration of all the factors involved the writers conclude that the disorders (which simulated those associated with streak disease) [*R.A.M.*, xiii, p. 797 and next abstract] actually represented the combined effects of adverse environmental conditions acting on an impaired constitution [cf. ibid., xiii, p. 178], the influence of virus diseases, if present, being of minor importance.

VERHOEVEN (W. B. L.). **Invloed van Zeeuwsche Blauwen op Eerstelingen.** [The influence of Zeeuwsche Blauwe on Eerstelingen.]—*Tijdschr. over Plantenziekten*, xl, 8, pp. 173–174, 1934.

In 1933 the influence of the Zeeuwsche Blauwe potato variety (which harbours the streak [*R.A.M.*, x, p. 746; xiii, pp. 179, 320, 464] virus in a masked form and itself incurs no damage from the disease) was tested on 92 Eerstelingen [Duke of York] plants grown in immediate

proximity. During the growing season 17 (18 per cent.) of the latter contracted primary streak symptoms and were lifted separately. A number of the stored tubers from these plants were so severely infected about the eyes that no sprouts were formed. Of the 56 plants derived from the remaining sprouted tubers 39 (69 per cent.) were diseased. Tubers were also saved from the 75 Duke of York plants showing no streak symptoms and 194 were planted out. Of the resulting plants 59 (33 per cent.) developed streak, which is not confined, therefore, to individuals showing external manifestations. It is thus of the utmost importance to isolate Zeeuwsche Blauwe, its two bud mutants, Zeeuwsche Bonte and Westeinder Blauwe, as well as Thorbecke and Bloemgraafje, all of which are latent carriers of streak, from other varieties in the Dutch potato fields.

GLYNNE (MARY D.). **Infectivity of summer sporangia of Potato wart disease in incipient infections on varieties immune in the field.**—*Nature*, cxxxiv, 3381, p. 253, 1934.

Potato varieties which in the field appear to be immune from wart disease (*Synchytrium endobioticum*) may, under laboratory conditions, develop a transitory form of infection, the summer, and occasionally the winter, sporangia developing in a normal manner until necrotic areas produced in the host interfere with the nutrition of the fungus and cause it to be sloughed off. Inoculations on the susceptible Arran Chief variety from such incipient infections bearing summer sporangia which developed in the laboratory on Snowdrop, Bishop, and Ben Cruachan (apparently immune in the field) gave positive results.

MAGEE (C. J.). **A new dip for Potato scab.**—*Agric. Gaz. New South Wales*, xlv, 8, pp. 441–442, 5 figs., 1934.

Excellent control of potato scab (*Actinomyces scabies*) as well as of *Rhizoctonia* disease [*Corticium solani*] has been obtained in New South Wales by the treatment recommended by G. H. Cunningham [*R.A.M.*, xii, p. 651], which consists in dipping the seed for ten minutes in a solution made by stirring 4 oz. mercuric chloride in 2 pints of commercial hydrochloric acid and diluting to 25 galls. The solution may safely be used for ten treatments, and if the duration of the dipping is then increased to fifteen minutes, for a further five. The potatoes should be immersed unbagged and afterwards dried. The process may be carried out some months before planting, and the total cost of the chemicals required to treat one ton of seed amounts locally to three shillings.

NORMAN (A. G.). **The biological decomposition of plant materials. Part IX. The aerobic decomposition of hemicelluloses.**—*Ann. of Appl. Biol.*, xxi, 3, pp. 454–475, 1934.

Continuing his studies on the biological decomposition of plant materials [*R.A.M.*, xii, p. 533], the author tested nearly seventy common fungi, mostly species of *Aspergillus* and *Penicillium*, for their ability to utilize on agar plates the crude hemicellulose from oat straw [ibid., xi, p. 263]; all grew reasonably well, the majority at least as well as on glucose. Occasionally a cleared zone due to an exo-enzyme was produced round the colony.

Twenty aerobic bacteria [the morphological and biochemical characters of which are described] capable of utilizing hemicelluloses were isolated from soil, manure, and straw; three were thermophilic. All utilized a very wide range of sugars and polysaccharides, and one group produced some acid and gas. Differentiation was obtained on saccharic acid and certain disaccharide acids. Fermentation tests showed that in pure culture none of the organisms actively decomposed hemicellulose either isolated or *in situ* in straw.

It is concluded that fungi are more active than bacteria in the natural decomposition of hemicellulose and that the ability to decompose cellulose is probably general among common fungi. A bibliography of 9 titles is appended.

Boshart (K.). **Die Krankheiten und Schädlinge der wichtigsten Arznei- und Gewürzpflanzen.** [The diseases and pests of the principal drug and spice plants.]—*Nachricht. über Schädlingsbekämpf.*, ix, 2, pp. 57–82, 6 figs., 1934. [English, French, and Spanish summaries on pp. 105, 107, 110.]

The writer summarizes very briefly the available information, supplemented by some personal observations in Germany, on the diseases and pests of a number of useful drug and spice plants. A bibliography of 50 titles is appended.

Cane disease resistance trials.—*Australian Sugar Journ.*, xxvi, 5, p. 263, 1934.

Writing in a recent issue of the *Cane Growers' Quart. Bull.*, A. F. Bell discusses and tabulates the results of some disease reaction trials conducted by the (Queensland) Bureau of Sugar Experiment Stations [cf. *R.A.M.*, xiii, pp. 324, 728]. The seedlings Q. 2 and 3 D. and the P.O.J. varieties 2878, 2940, 2727, 2714, and probably 2722 and 2875, are in general too susceptible to be grown in districts where red stripe top rot [*Phytomonas rubrilineans*] is prevalent. P.O.J. 2725, on the other hand, is highly resistant to this disease.

On account of their susceptibility to downy mildew [*Sclerospora sacchari*] P.O.J. 2940 and 2878 are considered to be unsuitable for the Lower Burdekin district. Here again the outcome of trials with P.O.J. 2725 was much more promising.

D'Emmerez de Charmoy (D.). **Nouvelle contribution à l'étude du streak.** [A new contribution to the study of streak.]—*Rev. Agric. de L'Ile de la Réunion*, N.S., xxxix, pp. 193–202, 3 figs., 1934.

R.P. 8 sugar-cane in an experimental field in Réunion showed two forms of streak [*R.A.M.*, xii, p. 328; xiii, p. 595], one characterized by the usual leaf stippling, and the other, and much the more prevalent, by long, colourless, translucent bands sometimes reaching a length of several cm., but never more than 0·5 mm. broad except where several parallel bands coalesced laterally. The appearance of the canes showing the stippling was almost equal to that of the healthy canes, which were then 2 m. high, but the canes showing the leaf banding were checked in development, in some places being not much over 50 cm. in height.

Experimental evidence showed that, after infection, streak passes

through two stages, of which the first, characterized by stippling, has very little adverse effect on the plant, while the second, characterized by leaf banding, is a dangerous stage in which the virus has, presumably, attained its maximum activity.

Bourne (B. A.). **Studies on the ring spot disease of Sugarcane.**—*Florida Agric. Exper. Stat. Tech. Bull.* 267, 76 pp., 21 figs., 2 graphs, 1934.

The history and geographical distribution of the ring spot disease of sugar-cane ordinarily attributed to *Leptosphaeria sacchari* [*R.A.M.*, xii, p. 552] are reviewed and the economic importance of the disorder discussed both as affecting commercial cultivation and the breeding of new varieties. The symptoms and histological effects of the disease on the leaves, leaf sheaths, and stems, mainly on canes grown in Florida, are described. Isolations from the spots made at various stages of their development yielded a number of organisms, but the results of inoculations with these were positive only in the case of *Helminthosporium ocellum* [ibid., xiii, p. 654], which must therefore be considered the primary cause of the disease. The ring spot symptoms, which in Florida usually appear in December and January on susceptible varieties, are emphasized by the subsequent development of such saprophytes as *Phyllosticta sorghina* Sacc. (with which *P. sacchari* Speg. [ibid., ii, p. 340; vi, pp. 148, 601; ix, p. 808], *P. panici* Young, and *P. hawaiiensis* Caum [ibid., i, p. 194] are considered to be identical) and *L. sacchari*. The other fungi commonly found on diseased plants, i.e., species of *Spondylocladium*, *Nigrospora*, and *Alternaria*, as well as a yellow bacillus, appear to be entirely without effect on the development of ring spot.

The spots on the leaf are at first minute, ivy-green to bronze-brown, and somewhat elongated. As they enlarge they become Burgundy or India red or Spanish raisin-coloured, with a distinct yellow areola. When fully developed the spot is somewhat irregular, 10 to 12 by 2·5 to 4 mm. in diameter and with a peach blow- to straw-coloured centre, the margin retaining the Spanish raisin tint. The yellow areola remains prominent at the ends of the spot, where it may measure 5 mm. or more in vertical extension as a narrow streak. On the sheaths and stem the spots are generally similar, though the coloured margin may be absent on the stem.

H. ocellum was observed to gain entrance to the leaves, sheaths, and stems through the epidermal wall, especially of the motor cells, and also through the stomata. Evidence was forthcoming that under carefully controlled conditions a mixture of *H. ocellum* and *P. sorghina* resulted in a more rapid development of lesions than that following inoculation with the former alone. *P. sorghina* has also been recorded on several other hosts, e.g., *Panicum maximum*, *P. dichotomiflorum* Michx. [*P. autumnale* Bosc], and sorghum, in association with ring spots primarily due to other fungi.

Proof was obtained of the genetic connexion between *L. sacchari* and a species of *Phyllosticta*, probably *P. saccharicola* Henn. The optimum temperatures for the growth of *H. ocellum*, *P. sorghina*, and *L. sacchari* were found to be 23·5°, 27°, and 21° C., respectively. Details are given of the physiological characters of *H. ocellum* and *P. sorghina* in relation to reaction (optima P_H 6·7 and 6·0, respectively), light, utilization of

carbohydrates, enzyme production, nitrogen fixation (negative), and the like. The former organism maintained its virulence in culture for $2\frac{1}{2}$ years.

The host range of *H. ocellum* has been extended from varieties of *Saccharum officinarum* to include hybrids between this species and *S. spontaneum* and *S. barberi*. Moreover, although the sorghum varieties Texas Seeded Ribbon and Kansas Orange are apparently immune, a number of intergeneric hybrids between them and sugar-cane have been found susceptible to ring spot. Under Florida conditions the following sugar-cane varieties are highly susceptible to infection by *H. ocellum*: Otaheite, Louisiana Purple and Striped, Cavengire Rayada, Ba. 11569, B. 417, B.H. 10 (12), L. 511, D. 74 and 95, P.O.J. 2878 and 100, F. 29/382, H. 109, and Cristalina. Tolerance is shown by S.C. 12/4, P.O.J. 2714, 2725, 2883, 36–M, and 36, and C.P. 27/139 (in an exceptionally high degree), while great resistance is manifested by Badila, P.O.J. 213, Co. 213, 214, 281, and 290, C.P. 807 and 27/108, Uba, Chunnee, U.S. 1694, and F. 29/416 and 29/7. In seven years' breeding experiments, combinations with a high proportion of Chunnee (*S. barberi*) 'blood' have given rise to a greater degree of susceptibility among the progeny than those in which *S. spontaneum* is largely represented, this parent conferring on its offspring marked resistance to ring spot.

Bolle (P[ierrette] C.). **Over het tegenwoordige stand van het pokkah-boeng-vraagstuk.** [On the present status of the pokkah-boeng problem.]—*Arch. voor Suikerind. Nederl.-Indië*, Deel I, xlii, 15, pp. 435–440, 1934.

In this lecture, read before a meeting of the Cheribon subdivision of the Java sugar industry experiment station, some outstanding features of the pokkah-boeng disease of sugar-cane [*Gibberella moniliformis*: *R.A.M.*, xiii, p. 686] are discussed in the light of the author's investigations (still in progress).

Three phases of the disease are differentiated, viz., (1) leaf infections, (2) arrested growth, and (3) death. Pokkah-boeng is seldom observed to develop in cane under two or over seven months old. Even in artificial inoculation experiments under the most favourable conditions for the fungus the incidence of infection among older canes was very low, the heightened resistance being apparently correlated with structural or chemical changes in the plant. These are in their turn conditioned by the influence of fertilizers, the exact nature of which is not fully understood though nitrogen assimilation evidently plays an important part.

Pokkah-boeng (1) is most in evidence in December, but it actually originates in the previous month, coincident with the onset of heavy rains. The percentage of this form of the disease appears to decline in the later plantings (August and September). On the other hand, stage (3) is liable to reach a maximum in the later plantings, though here the results are conflicting and this aspect of the problem requires further investigation. In the meantime it is necessary to combine a judicious manuring scheme with correct planting times in such a way as to afford optimum growing conditions and ensure a desirable correspondence between the weather and the stage of development of the cane.

LUND (A.). **Studies on Danish freshwater Phycomycetes and notes on their occurrence particularly relative to the hydrogen-ion concentration of the water.**—*Kgl. Danske Vidensk. Selsk. Skr., Naturv. og Math. Afd.*, 9 Rœkke, vi, 1, 98 pp., 39 figs., 1934.

An annotated list is given of all the fresh-water Phycomycetes observed in Denmark during 1930–2, accompanied in the case of certain species new to science or to the country by detailed descriptions. The ecological relations of the fungi observed are discussed in some detail.

YEN (W. Y.). **Première note sur quelques Ustilaginés de Chine.** [A first note on some Chinese Ustilagineae.]—*Ann. de Cryptog. Exot.*, vii, 1, pp. 11–20, 2 pl., 1934.

Notes are given on some common smuts of cultivated plants in China. In discussing *Sphacelotheca sorghi* the author describes the spores as very finely warty, and not smooth, as is usually stated.

MILES (L. E.). **The rusts of Mississippi.**—*Plant Disease Reporter*, xviii, 6, pp. 54–73, 1934. [Mimeographed.]

An annotated list is given of 162 Uredinales occurring in Mississippi. Thirty-two species of rusts and 31 hosts are new records for the State.

ITO (S.). **Cultures of Japanese Uredinales I.**—*Bot. Mag.*, Tokyo, xlviii, 572, pp. 531–539, 1934.

Details are given of the writer's inoculation experiments with ten heteroecious rusts collected in Hokkaido, Northern Japan [cf. *R.A.M.*, xiii, p. 201]. Twenty-four species of *Thalictrum* were successfully infected by *Puccinia triticina* from wheat [ibid., xi, p. 629].

FRASER (LILIAN). **An investigation of the sooty moulds of New South Wales. I. Historical and introductory account.**—*Proc. Linn. Soc. New South Wales*, lviii, 5–6, pp. 375–395, 1933.

After a discussion of earlier investigations into the composition, systematics, and physiology of the sooty mould fungi [cf. *R.A.M.*, x, p. 558; xiii, p. 186] the author states that the organisms concerned belong to the following groups: (*a*) Capnodiaceae, which include the chief and most characteristic members of the group, (*b*) Atichiaceae, of which the commonest species, *Atichia glomerulosa*, is a widespread constituent of these mould growths, and (*c*) Fungi Imperfecti, which are sometimes present to the exclusion of all others. Of this last group, *Dematium pullulans* and *Cladosporium herbarium* are the chief members.

In New South Wales, the sooty moulds *Capnodium salicinum* (= *Teichospora salicina* (Mont.) Gäum.) and *Antennularia scoriadea* are the commonest members of the first group. *Atichia glomerulosa*, *D. pullulans*, and *C. herbarum* also are widespread. Locally, there are two types of sooty mould, a perennial type which develops on perennial shrubs and trees, and an annual type found on annual herbs attacked by aphids. The former, which is by far the more common, and represents the highest development attained by the sooty mould community, consists of dominant members of the Capnodiaceae (of which only the two

mentioned above have been identified so far), together with *A. glomerulosa* (which is often found alone) and a variety of Fungi Imperfecti, especially *Cladosporium*, *Dematium*, and *Triposporium*. The latter consists exclusively of Fungi Imperfecti, the dominant fungus usually being *D. pullulans* or *C. herbarum*, others found including *Alternaria*, *Brachysporium*, *Asbolisia*, and *Epicoccum*.

Evidence is given that the various spore forms attributed by McAlpine to *Capnodium citricolum* do not all belong to the one species.

FRASER (LILIAN). **An investigation of the sooty moulds of New South Wales. II. An examination of the cultural behaviour of certain sooty mould fungi.**—*Proc. Linn. Soc. New South Wales*, lix, 3–4, pp. 123–142, 59 graphs, 1934.

In a series of experiments conducted to ascertain whether appreciable differences exist between the Australian sooty moulds [see preceding abstract] and certain other moulds in their ability to utilize different classes of food material, the author grew *Botrytis cinerea*, *Penicillium expansum*, *Asbolisia* sp., *Cladosporium herbarum*, *Dematium pullulans*, *Caldariomyces* sp. (near *C. fumago* Woron.), *Capnodium* sp. (2 strains), and *Microxyphium* sp. A (2 strains), sp. B, and sp. C on various media, using the two first-named as controls and the rest as sooty mould representatives.

The results obtained [which are tabulated, expressed graphically, and fully discussed] showed that *P. expansum* and *C. herbarum* utilized a wide range of carbohydrates. The other fungi utilized pentoses, mannose, and lactose rather less well. Only *D. pullulans* and *B. cinerea* failed to grow on raffinose. All grew well on inulin, dextrin, and starch.

P. expansum used the widest range of nitrogenous compounds. *C. herbarum* grew satisfactorily on peptone, potassium nitrate, and sodium nitrate only. Asparagin caused pronounced staling of both. The Capnodiaceae grew moderately well on all nitrogenous media tested.

Fruiting was poor in all the fungi tested at low carbohydrate-nitrogen ratios when nitrogen was present in high concentrations.

Staling was marked in agars of moderate sugar and high peptone concentration, but much less so when sodium nitrate replaced peptone. As a rule, staling did not occur when the concentration of both sugar and nitrogen was high. Staling and decreased spore production appeared to be to some extent related.

Each species had a different optimum concentration and a different range of concentrations, both of carbohydrate and nitrogen, suitable for growth.

WALLACE (G. B.). **Diseases of Tobacco.**—*Tanganyika Dept. of Agric. Mycol. Leaflet* 15, 7 pp., 1934.

Notes are given in semi-popular terms on the symptoms and control of the following tobacco diseases hitherto observed in Tanganyika: mosaic (recognized with certainty only in the Iringa Province but probably more widely distributed); leaf curl [*R.A.M.*, xii, p. 143]; wildfire (*Bacterium tabacum*) in the Songea district; mildew (*Erysiphe cichoracearum*) and frog-eye spot (*Cercospora nicotianae*), both prevalent

throughout the Territory [ibid., xii, p. 201]; and red rust [ibid., x, p. 585], another disorder of common occurrence associated with unduly low topping in a dry period followed by rain.

HOLMES (F. O.). **A masked strain of Tobacco-mosaic virus.**—*Phytopath.*, xxiv, 8, pp. 845–873, 5 figs., 1934.

A summary of the writer's experiments on the effects induced in various Solanaceous hosts by a completely masked strain of the tobacco mosaic virus in comparison with those produced by the common field type, which causes distortion of the host plant, has already appeared [*R.A.M.*, xiii, p. 399]. In the present paper reference is further made to tests with the so-called 'mild-mottling' strain, the symptoms induced by which were intermediate between those of the two extreme types under discussion. Mixtures of the distorting strain and the attenuated mottling and masked forms were readily distinguishable from single-lesion stocks of the first-named when as little as 1 per cent. of the admixture was present. Small inoculations of such stocks into healthy stem tissues incubated at temperatures just over 34° C. frequently gave rise to attenuated strains, the evidence suggesting that these attenuated strains arose from the old stock. The two principal differences between the distorting and attenuated strains were as follows. The latter were able to increase in the host tissues at temperatures sufficiently high to inhibit the multiplication of the former. The symptoms of the attenuated strains were less pronounced and slower to involve the tissues near the growing point than those of the original mosaic virus, resembling in this respect the relationship between the distorting strain and its symptomless carriers.

SCHMIDT (M.). **Immunitätszüchtung bei Tabak.** [Breeding for immunity in Tobacco.]—*Naturwissensch.*, xxii, 33, pp. 557–559, 1934.

Of 102 varieties, types, and strains of *Nicotiana tabacum* tested at the Kaiser Wilhelm Genetic Research Institute, Müncheberg, Mark Brandenburg, for reaction to tobacco wildfire (*Pseudomonas tabaci*) [*Bacterium tabacum*: *R.A.M.*, xii, p. 600], all proved susceptible, as also did nine varieties of *N. rustica*. *N. glutinosa*, *N. paniculata*, and *N. langsdorffii* were also attacked, whereas a form designated *N. viscosa* but probably identical with *N. langsdorffii* var. *longiflora* was resistant. A number of resistant forms occur among the section *petunioides*, including *N. affinis* (*N. alata* var. *grandiflora*), *N. micrantha*, and (in a lesser degree) *N. plumbaginifolia*, *N. fragrans*, and *N. speciosa*. *N. silvestris* is susceptible, *N. longiflora* only slightly so, while *N. sanderae*, in accordance with its hybrid origin, segregates into susceptible and slightly susceptible.

The use in inoculation experiments of a highly virulent strain of the pathogen isolated by Stapp resulted in rapid and heavy infection. Slightly susceptible varieties often present a somewhat aberrant type of infection, characterized by a small brown lesion encircled by a ring of minute, brown dots. In the field in 1933 it was observed that those varieties which were most susceptible in greenhouse tests contracted only slight infection. The mass infection of seedlings by Stapp's method gave very satisfactory results from the standpoint of selection, the

disease generally being so severe as to kill most of the batches of 200 to 400 plants. Of the resistant survivors, *N. affinis* was mostly used in further tests; it was found that infection is readily contracted by the first leaves, which, however, rapidly recover. Among the *N. sanderae* plants were 43 healthy, 45 severely diseased, and 7 killed, while the F_2 progeny of a cross between *N. tabacum* and *N. affinis* yielded 197 healthy and 164 killed.

The application of these data to further breeding experiments is briefly discussed.

Doolittle (S. P.) & Sumner (C. B.). **Probable occurrence of Australian spotted wilt of Tomatoes in Wisconsin.**—*Phytopath.*, xxiv, 8, pp. 943–946, 1 fig., 1934.

No recurrence of the tomato disease observed in Wisconsin in 1931 and tentatively identified with Australian spotted wilt [*R.A.M.*, x, p. 414] has taken place, but in view of similar reports from California and Oregon [ibid., ix, p. 275; xiii, pp. 278, 807], the symptoms which lead the authors to consider that the Wisconsin disease was spotted wilt are described and illustrated.

Borissoff (P. N.). Грибные вредители Кавказских древесных пород, их хозяйственное значение и меры борьбы. [Fungi injurious to forest trees in the Caucasus, their economic importance and control.]—*U.S.S.R. Central Forestry Res. Inst. Bull.* 2 (*Problems of Forest Protection*), Leningrad, pp. 7–42, 20 figs., 2 diags., 1934. [English summary.]

In this detailed report of his phytopathological survey in 1930–1 of the forests of the Black Sea littoral of the Caucasus, the author gives comprehensive notes on the fungi causing injury to the trees (arranged by the hosts), among which the following may be mentioned. A brief description (with Latin diagnosis) is given of *Ceratostomella buxi* n. sp., which causes a blue stain of the wood of *Buxus sempervirens*; the fungus is characterized by globular perithecia, 300 to 350 μ in diameter, covered with sparse reddish hairs and provided with a beak (occasionally two) measuring 300 to 560 by 30 to 55 μ. The asci are hyaline, clavate, 15 to 22·5 by 4·5 to 6 μ, and contain hyaline, cylindrical, slightly bent spores, 3 to 6 by 0·75 to 1·5 μ in diameter. The other fungi found on this host include *Poria ferruginosa* [*Fomes ferruginosus*] and *Rosellinia aquila* [cf. *R.A.M.*, viii, p. 378]. *F. rimosus* [ibid., xii, p. 254] is reported as a parasite on *Pistacia mutica* [*P. terebinthus*] and *F. fomentarius* [ibid., xii, p. 343], *F. applanatus* [*Ganoderma applanatum*: ibid., xiii, p. 604], *Hydnum ochraceum* [ibid., xi, p. 497], and *Polyporus fumosus* [ibid., xi, p. 684] on the walnut (*Juglans regia*), *F. fomentarius* being the chief local parasite of this host. Chestnuts (*Castanea vesca*) were severely injured by *P. sulphureus* [ibid., xii, p. 795], which sometimes affected 60 per cent. of the stand and was also destructive to the yew (*Taxus baccata*). About 30 per cent. of the *Juniperus excelsa* stands were found to be severely attacked by *F. juniperinus* [ibid., x, p. 571], while *F. ribis* [ibid., x, p. 271] was recorded on pear.

The Elm disease in New York and New Jersey.—*Science*, N.S., lxxx, 2070, p. 200, 1934.

Of the $150,000 appropriated by the New York State Legislature for the control of the Dutch elm disease [*Ceratostomella ulmi*] in the State [*R.A.M.*, xiii, p. 811], $142,500 has been allocated to the Department of Agriculture and Markets for the actual work of eradication and the remaining $12,500 to the State College of Agriculture, Cornell University, for research on the disease. The number of infected trees in New Jersey was found to be unexpectedly large and 1,000,000 in the Essex, Union, and Hudson counties are reported to be threatened owing to lack of Federal funds for their treatment. The legislature has appropriated $30,000 for the destruction of diseased elms, of which 731 have already been felled. It is estimated by the Secretary of Agriculture that a minimum of $250,000 will be required for this purpose during the present and coming fiscal years. It is proposed to use the balance of the Federal and State funds available to establish a barrier zone five to ten miles wide round the infected area, removing elms in that sector to prevent the extension of the disease and leaving those within the infected radius to their fate. A recent statement by L. A. Strong, chief of the Bureau of Entomology and Plant Quarantine, is quoted, urging the need for a vigorous and consistent eradication campaign to save the American elm from extinction.

JACOT (A. P.). **Acarina as possible vectors of the Dutch Elm disease.**—*Journ. Econ. Entom.*, xxvii, 4, pp. 858–859, 1934. [Abs. in *Rev. Appl. Entom.*, Ser. A, xxii, 11, p. 649, 1934.]

Certain irregularities in the transmission of *Ceratostomella ulmi* by *Scolytus multistriatus* suggest the implication of another independent factor in the spread of Dutch elm disease, trees affected by which have been found in the United States [see preceding abstract] without showing any trace of Scolytids. Most of the ten species of mites commonly found in elm bark can probably be eliminated as carriers of the fungus, but Tyroglyphids attach themselves in the 'wandering nymph' stage to other arthropods for transport to a fresh tree or locality. As many as thirty of these mites, which are known to be numerous at times on the coremial beds of *C. ulmi* in the egg tunnels of *Scolytus* and *Hylastes* (*Hylurgopinus*), have sometimes been found adhering to a single adult of *S. multistriatus*, while up to six or seven Gamasoid mites may be found on the beetle *Eutetrapha* (*Saperda*) *tridentata*, which is common on elms.

United States Department of Agriculture. Bureau of Plant Quarantine. Service and regulatory announcements, April–June, 1934. Quarantine and other official announcements.—pp. 33–35, 38–55, 1934.

In a second revision (15th May, 1934) of the classification of *Berberis* and *Mahonia* under the black stem rust [*Puccinia graminis*] quarantine (No. 38) [cf. *R.A.M.*, xii, p. 400], *B. gilgiana* and *B. sanguinea*, formerly placed in the doubtful list (group D), are transferred to the resistant category (group B).

A Press notice dated 26th June, 1934, states that two major units of the United States Department of Agriculture, the Bureau of Entomo-

logy and the Bureau of Plant Quarantine, have been merged into a single Bureau of Entomology and Plant Quarantine. K. F. Kellerman, formerly associate-in-chief of the Bureau of Plant Industry, will be entrusted under the new organization with the activities relating to the eradication and control of citrus canker [*Pseudomonas citri*: see next abstract], phony peach disease [ibid., xiii, p. 671], Dutch elm disease [*Ceratostomella ulmi*: see preceding page], white pine blister rust [*Cronartium ribicola*: ibid., xii, p. 400], and stem [black] rust of grains [*P. graminis*].

Summaries are given of the plant quarantine import restrictions obtaining in the Philippine Islands, French Mandate of Syria, British Honduras, Jamaica, Norway, Peru, New Zealand (Samoa), and the Commonwealth of Australia. In a footnote to the Norwegian regulations for the exclusion of potato wart (*Synchytrium endobioticum*) [ibid., xiii, p. 672], it is stated that the importation into Norway of potatoes grown in the United States is prohibited on account of the localized presence of the disease in several States [ibid., viii, p. 123; xii, p. 51]. The Australian regulations against the introduction of fireblight (*Bacillus amylovorus*) [ibid., iv, p. 384] are amended, as from 18th April, 1934, to the following effect. The importation into Australia is prohibited of deciduous fruit trees or parts thereof, and Rosaceous plants or parts thereof, grown in any country where fireblight is known to exist, except New Zealand, whence apples may be conditionally imported from districts free from the disease [ibid., xi, p. 184]. Permission may further be granted, at the discretion of the Minister of Health, for the importation of ornamental plants or of new or special varieties of deciduous fruit trees.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Revision of notice of Quarantine No. 19 on account of Citrus canker and other Citrus diseases.—3 pp., 1934. [Mimeographed.]

As from 1st September, 1934, the scope of Quarantine No. 19 on account of citrus canker [*Pseudomonas citri*: *R.A.M.*, xi, p. 752; xii, p. 433] has been considerably modified by the release from prohibition of entry into the United States of all members of the sub-family Citratae of the family Rutaceae except those comprised in the single tribe Citrinae, including the ordinary citrus species and their near botanical relatives. A number of the plants thus accorded entry are cultivated as ornamentals in the southern States; their admission will still be subject to the provisions of Quarantine No. 37, regulating commerce in nursery stock, plants, and seeds [ibid., ix, p. 688; xii, p. 335].

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vi, 6, p. 120, 1934.

Austria. As from 13th March, 1934, the existing regulations for the importation of potatoes into Austria are amended to permit under proper official safeguards the entry of consignments from the following countries deemed to be free from wart disease [*Synchytrium endobioticum*: *R.A.M.*, x, p. 560]: Egypt, Italy, Jugo-Slavia, the islands of Malta [ibid., xiii, p. 799] and Cyprus, Spain, and Hungary.

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New Zealand. State Forest Service. Annual Report of the Director of Forestry for the year ended 31st March, 1934.—17 pp., 1934.

The following items of phytopathological interest occur in this report (compiled by A. D. McGavock). A very marked increase in the numbers of dead saplings in young exotic forests of the pole stage (consisting mainly of *Pseudotsuga taxifolia*, *Pinus laricio*, *P. ponderosa*, *P. muricata*, *P. murrayana*, *P. radiata*, and *Cupressus lawsoniana*) was observed following a protracted drought in the Nelson district, probably due to the renewed activity of *Diplodia* [*pinea*] killing [*R.A.M.*, xiii, p. 553] in dense stands of weakened stock. Owing to the virtual absence of late frosts during October and November, the virulence of *Phomopsis* [*strobi*: loc. cit.], which caused a severe wilt in the above-mentioned forests during the two past seasons, was greatly mitigated. Experiments in refrigeration chambers have shown that *P. strobi* gains entry into the pine tissues chiefly through the minute lesions produced by frost on early flushing shoots. It has been found that fungal diseases are commonly introduced on tree seeds, and attempts are in progress to develop an effective, simple, and cheap routine method of disinfection.

ZELLER (S. M.). **Some new or noteworthy fungi on Ericaceous hosts in the Pacific Northwest.**—*Mycologia*, xxvi, 4, pp. 291–304, 1 pl., 5 figs., 1934.

An annotated list is given of 25 parasitic and saprophytic fungi occurring on Ericaceae in the Pacific North-west, of which the following may be mentioned. The leaves of *Arbutus menziesii* are destructively attacked by *Mycosphaerella arbuticola*, sometimes causing severe defoliation.

Exobasidium burtii n. sp., producing circular, buff spots, 1 to 2 cm. in diameter, on the leaves of *Rhododendron albiflorum*, is characterized by hypophyllous, tetrasporous basidia, 18 to 28 by 5 to 7 μ; stout, prominent sterigmata; early triseptate (sometimes one cell longitudinally septate), hyaline, ellipsoid to allantoid basidiospores, 17·7 to 24 by 5 to 6·5 μ; and abundant hyaline, continuous, narrow, cylindrical, usually straight conidia, 7 to 13 by 0·7 to 1·5 μ. This species was doubtfully referred by Burt (*Ann. Missouri Bot. Gard.*, ii, p. 650, 1915) to *E. vaccinii*. Notes are also given on *E. ledi* on *Ledum glandulosum*, *E. parvifolii* [ibid., vi, p. 646] on *Vaccinium parvifolium*, *E. vaccinii* on a

large number of hosts (including *Arctostaphylos*, *Rhododendron*, and *V.* spp.), and *E. vaccinii-uliginosi* [ibid., vi, p. 587], the causal organism of a witches' broom with white or pinkish leaves on *R. californicum* (cf. *Phytopath.*, x, p. 273, 1920), witches' broom of *V. ovatum*, and 'shoot galls' of *A. columbiana* and *Phyllodoce empetriformis*.

Cryptostictis arbuti (Bonar) Zeller (*Disaeta arbuti* Bonar: *Mycologia*, xx, p. 299, 1928) is associated with a leaf spot of *Arbutus menziesii*, *L. glandulosum*, and *A. columbiana*. *C. mariae* (Clinton) Sacc. appears to be identical with the fungus usually referred to *Coryneum rhododendri* Cke. It produced on *R. californicum* leaves characteristic 'bull's eye', concentric spots, 4 to 25 mm. in diameter. The sole essential difference between these two species of *Cryptostictis* is the number of septa in the spores (four in *C. arbuti* and five in *C. mariae*).

LACHMUND (H. G.). **Seasonal development of Ribes in relation to spread of Cronartium ribicola in the Pacific Northwest.**—*Journ. Agric. Res.*, xlix, 2, pp. 93–114, 1 graph, 1 map, 1934.

The author gives a summarized account of inoculation experiments with the white pine blister rust, *Cronartium ribicola*, on four species of *Ribes*, namely, *R. petiolare*, *R. inerme*, *R. viscosissimum*, and *R. lacustre* (the most important in the Pacific North-west), conducted since 1926 in British Columbia. The results showed that the leaves were susceptible to aecidiosporal infection from the time they broke out of the buds, the periods of highest susceptibility ranging in general between the ages of 2 and 16 days, after which susceptibility declined, in some cases very sharply.

The most favourable period for spread by aecidiospores occurs when the maximum spore dispersal from a given infected pine centre coincides with the time when the largest proportion of the *Ribes* leaves lying within the long-distance range of air-borne spores are in the most susceptible stages of development. There was evidence that variations in seasonal conditions affect more the time at which the *Ribes* leaves develop than the time of aecidiospore production. Thus, an early spring advances the development of the leaves to a stage beyond maximum susceptibility at the time when the production of aecidiospores is greatest. It may, however, favour spread to higher altitudes and to the north, where spring is later and the *Ribes* leaves may be in more susceptible stages of development. A late spring should have an opposite effect. In general, conditions advancing spring in the north and retarding it in the south tend to extend the range of favourable conditions for long-distance spread of the rust, and vice versa. The farthest northward spread may be expected from infected pines growing at high altitudes to *Ribes* plants at low elevations in the north, and the longest southward spread from aecidiospore sources at low altitudes to *Ribes* at high elevations farther south.

PERCIVAL (W. C.). **A contribution to the biology of Fomes pini (Thore) Lloyd (Trametes pini [Thore] Fries).**—*Bull. New York State Coll. of Forestry* (*Tech. Publication* 40), vi, 1 b, 72 pp., 20 figs., 4 graphs, 1933. [Received November, 1934.]

After noting the host range and geographical distribution of *Trametes*

pini, the author (who prefers the name *Fomes pini* as the sporophores are perennial and the tubes stratified) states that the hyphae grow saprophytically in the heartwood of infected red spruce (*Picea rubra*) but were not found in the living cells of the sapwood, the evidence indicating that the fungus enters this host only as a saprophyte.

In New York the spores of *T. pini* are released most abundantly during two short periods, one in spring, the other in early autumn, when after a cool spell the prevailing temperature rises to over 50° F.; very light spore production continues as long as the average weekly temperature is over 32°, while a continuously maintained temperature of over 50° induces hyphal growth in the sporophore tubes and the development of a new tube layer.

In culture, spore germination was favoured by media with a high sugar content, reaching 93·2 per cent. on malt agar. High germination took place only on media the P_H value of which lay between 5 and 6; on alkaline media there was no germination. Media rich in sugar were also those most favourable to mycelial growth, which was, however, little affected by the P_H value. The mycelium grew at a temperature range of 6° to 30° C., the optimum being about 25°. Exposure to light through window glass caused darkening of the mycelium, which was accentuated, with the suppression of aerial hyphae, by exposure to the ultra-violet rays in sunlight in addition to the visible spectrum.

When cultures of *T. pini* from *P. rubra*, *Pinus strobus*, and *P. monticola* associated with different types of decay were inoculated into 1-inch blocks of sound red spruce heartwood all the blocks developed typical pocket rot. The loss in specific gravity varied from 4·95 to 10·28 per cent. after nine months, the greatest variation occurring in the blocks inoculated from *Picea rubra*. The loss in crushing strength varied in the same period from 9·3 to 40·9 per cent., the extremes again being given by cultures from the one host, *P. rubra*.

Red rot, pocket rot, and ring scale developed in different woods inoculated with a subculture of the fungus from one individual mycelium, demonstrating that variations in the type of decay caused by *T. pini* are due entirely to host differences.

A bibliography of 85 titles is appended.

Vanine (S. I.) & Kotchkina (Mme E. M.). Фитопатологическое обследование подсоченных насаждений в Сиверском Леспромхозе. [A phytopathological survey of stands tapped for turpentine in the Siverskaya forest estate.]—*U.S.S.R. Central Forest. Res. Inst. Bull.* 2 (*Problems of Forest Protection*), Leningrad, pp. 67–83, 3 figs., 3 diags., 1 graph, 1934. [English summary.]

During a four-year survey of the pine and spruce trees utilized for turpentine extraction in the Siverskaya forest estate (near Leningrad), a number of blue-staining fungi were observed, their incidence being much higher in trees subjected to the Russian than to the German method of tapping. Where the former method is adopted, the stains may cover 30 to 80 per cent. of the tapped surface by the fourth year, whereas in the latter only the salient edges of the cuts are involved. In no case were the fungi observed to penetrate below a depth of 2 mm. in the wood. Spruces are more extensively damaged

than pines by blue-staining fungi, and are further liable to attack by *Corticium leve,* which causes a yellowish-brown discoloration from the second year of extraction onwards and reduces the value of the timber.

The wood-staining fungi recorded on tapped pines included *Ceratostomella picea* [*R.A.M.*, xii, p. 195], *Endoconidiophora coerulescens* [ibid., ix, p. 76], *Cladosporium herbarum, Epicoccum purpurascens* [ibid., xii, p. 69], and *Fusarium* sp., and on the spruces the same, with *Ceratostomella pini, Hormonema dematioides* [ibid., xi, p. 616], *Macrophoma* sp., and *Corticium leve.* Tests to determine the resistance of these [and a number of other] species to temperature showed that *Ceratostomella picea* and *C. pini* survived one hour's exposure to 60° C., while *Cladosporium* sp., *H. dematioides,* and *F.* sp. proved resistant to fluctuations of temperature between 20° and –19° C.

Oleoresin and turpentine were found not to be toxic to the agents of blue stain, the former in a solidified state merely acting as a mechanical check on mycelial progress.

NELSON (R. M.). **Effect of bluestain fungi on Southern Pines attacked by bark beetles.**—*Phytopath. Zeitschr.*, vii, 4, pp. 327–353, 2 figs., 1 diag., 2 graphs, 1934.

A comprehensive, fully tabulated account is given of the writer's investigations in North Carolina on the connexion between blue-staining fungi (*Ceratostomella pini* and *C. ips*) and bark beetles (*Dendroctonus frontalis* and *Ips* spp.) in three species of pine, viz., *Pinus echinata, P. rigida,* and *P. virginiana* [cf. *R.A.M.*, xii, p. 409].

The blue-stain fungi were observed to grow from points along the insect galleries to form irregular, black patches on the surface of the wood. The hyphae further invade the sapwood along the medullary rays to form wedge-shaped sectors of blue wood, being also found in the resin ducts and occasionally in the ray and wood tracheids.

Many of the trees inoculated with the two species of *Ceratostomella* developed blue stains, and some died. *C. pini* is thought to be probably indispensable to *D. frontalis,* since it effects a reduction of the water content of infested trees sufficient to admit of beetle brood development. The girdling effect of the insect tunnels would eventually destroy the invaded pines, but the primary cause of death is believed to be the action of the staining fungi on the tori in the wood tracheids. In affected areas the tori of the bordered pits are mostly deflected to one side in such a way as to block the opening and prevent the passage of the transpiration stream from one tracheid to another.

LIESE (J.) & STAMER (J.). **Vergleichende Versuche über die Zerstörungsintensität einiger wichtigen holzzerstörenden Pilze und die hierdurch verursachte Festigkeitsverminderung des Holzes.** [Comparative experiments on the destruction intensity of some important wood-destroying fungi and the resultant decline of firmness in the wood.]—*Angew. Bot.*, xvi, 4, pp. 363–372, 2 graphs, 1934.

Observations were made under controlled conditions on the progressive destruction of pine sapwood blocks by pure cultures of *Merulius domesticus* [*M. lacrymans*], *M. sylvester* [*R.A.M.*, xiii, p. 609], *Conio-*

phora cerebella [*C. puteana*: ibid., xiii, p. 70], and *Polyporus vaporarius* [*Poria vaporaria*: ibid., xiii, p. 137].

M. lacrymans was found to cause the maximum loss of weight, amounting to about 45 per cent. of the total after six months, followed by *C. puteana* (35), *P. vaporaria* (22), and *M. sylvester* (10 per cent.). *M. lacrymans* was also responsible for the greatest decrease in the firmness of the wood as determined at the wood-testing station in Berlin-Dahlem on carefully selected anatomically similar laths of sapwood (98 per cent. loss after six months), the most rapid progress being made both by this organism and *C. puteana* during the first two months. Thus, a 50 per cent. loss of firmness corresponds, in the case of *M. lacrymans*, to a 10 per cent. reduction of weight; for *C. puteana* a 60 per cent. decline in firmness coincides with a 20 per cent. decrease in weight. The other two fungi caused a relatively inconsiderable diminution of strength. Evidently the fungi select different constituents of the cell wall in order of preference, those singled out by *M. lacrymans* in the first place being such as impart solidity to the tissues. The reputed preference of *M. lacrymans* for cellulose is not borne out by these experiments, since the fungus first withdraws the encrusting components that act as binding elements.

These data are considered to throw fresh light on the serious character of the depredations of the dry rot fungus and to afford further justification for its special position in litigation. Of late years attention has been primarily directed towards the ravages caused by *C. puteana* in insufficiently dried new structures, but *M. lacrymans* also possesses the capacity, not shared by other important timber-destroying fungi, of spreading to air-dry wood in the absence of ventilation [ibid., xii, p. 259].

DIDDENS (HARMANNA A.). **Eine neue Pilzgattung, Hyalodendron.** [A new fungus genus, *Hyalodendron*.]—*Zentralbl. für Bakt.*, Ab. 2, xc, 14–19, pp. 315–319, 4 figs., 1934.

In 1933 a number of fungus cultures isolated from ground pulp in Swedish paper factories were submitted by Prof. Melin to the Centraalbureau voor Schimmelcultures for identification. All were of a more or less yeast-like appearance and exerted an antagonistic action on the blue-staining organisms [*Cadophora fastigiata*, *Lecythophora lignicola* Nannf., and *Trichosporium heteromorphum* Nannf.] recently investigated by Melin [*R.A.M.*, xiii, p. 531]. Most of the cultures were referable to the Mycotoruleae [ibid., xiii, p. 767], but three could not be assigned to any known genus. These were characterized either by moist, coarsely pubescent, rugose, dirty yellow colonies or by those of a pure white, dry, almost pulverulent aspect. A true hyaline mycelium was present, and chains of minute, hyaline conidia were borne laterally and terminally on the dendritic conidiophores. A new genus, *Hyalodendron*, is established for these fungi and, together with the type species, *H. lignicola* n. sp., described in German and Latin.

The conidiophores of *Hyalodendron* resemble those of *Hormodendrum*, but are hyaline. The sweet pea parasite in England named by Dowson *Cladosporium album* [ibid., iii, p. 652] agrees closely with *Hyalodendron* which also possesses, in a less conspicuous form, the polar projections

typical of *C. herbarum*. The author proposes, therefore, to transfer the sweet pea fungus from *Cladosporium* to the new genus *Hyalodendron* as *H. album* (Dowson) n. comb. Both in spore dimensions (3·5 to 15 by 2·5 to 5·5 μ) and specific parasitic behaviour the latter differs from the pulp species.

Hyalodendron differs from *Oidiodendron* [ibid., xii, p. 69] in that in the latter the conidia are formed by hyphal division and not by acrogenous and pleurogenous budding.

The conidia of *H. lignicola* are mostly oval to elongated or irregular, furnished in some cases with polar projections, and measure 4·8 by 2·3 μ or 2·5 to 12 by 1·5 to 3·5 μ (mostly 2·5 to 6 by 2 to 2·5 μ).

Two distinct forms of *H. lignicola* were further differentiated as f. *undulatum* n.f. and f. *simplex* n.f., the former characterized by an undulant mycelium and sometimes by a spiral rolling of the hyphal tips, and the latter by predominantly simple conidial chains, often springing vertically from the hyphae.

Good growth was made at 25° C. by the pulp fungi on a number of standard media, of which beerwort agar was particularly suitable for differential purposes; on wood (*Acer* and *Pinus*) development was relatively sparse.

RICHARDSON (N. A.). **A note on creosotes extracted from old timbers.**— *Journ. Soc. Chem. Ind.*, liii, 33, pp. 710–712, 1934.

Details are given of a recent examination of creosoted Baltic redwood (*Pinus sylvestris*) railway sleepers and telegraph poles after varying periods of service (25 to 30 years in the case of the former and 18 to 57 in that of the latter). It was found that the higher boiling oils possess a greater degree of permanency than the low boiling ones [*R.A.M.*, ix, p. 620]. The tar acids had not entirely disappeared from the wood even after a number of years, while in the case of the sleepers a fairly large quantity of naphthalene was left. The sleepers were well preserved by creosotes of high naphthalene content, whereas the poles were adequately protected by oils containing only small amounts of naphthalene. The estimated losses of creosote from the sleepers and poles are 50 to 90 and 60 to over 90 per cent., respectively. Determinations of two residual oils showed that these were less toxic than ordinary creosote to wood-destroying fungi [cf. ibid., xiii, p. 137].

HURST (R. R.). **Observations on the brown heart disease of Turnips.**— *Scient. Agric.*, xiv, 12, pp. 679–686, 1 pl., 1 map, 1934. [French summary.]

The physiological disorder of turnips known as brown heart [*R.A.M.*, xi, p. 276] causes an annual loss of at least $50,000 in Prince Edward Island, where though widely distributed, it is not prevalent in the north; the condition is also found on the mainland of Canada, as well as in the United States and Europe. The affected turnips have a bitter taste and are woody when cooked. Four strains, Metts Bangholm (Godfrey), Halls Westbury (Ewing), Good Luck (Steel Briggs), and Carters Purple Top Swede are immune. Date of seeding and soil reaction did not affect the incidence of the disease, but increased manuring diminished its

incidence and it did not develop in plants growing on the former sites of manure heaps.

SNYDER (W. C.). **A leaf, stem, and pod spot of Pea caused by a species of Cladosporium.**—*Phytopath.*, xxiv, 8, pp. 890–905, 3 figs., 1934.

Peas in Monterey County and elsewhere along the Californian coast were observed in 1932 to be suffering from a leaf, stem, and pod infection estimated to be responsible for a reduction of 5 to 10 per cent. or more of the picked crop. On the foliage the necrotic lesions are roughly circular to irregular, tan-coloured, with a narrow, dark brown edge. On the stems and pods they are of variable shape, dark brown to black, with well-defined black lines of demarcation on the latter organs.

The causal fungus produced a dull, greenish-black, submerged mycelium, and uni- to pluriseptate, simple, brown conidiophores, 75 to 225 μ in length, bearing clusters of light brown, concatenate conidia of two types, (*a*) ovoid to ellipsoid, somewhat pointed at the ends, continuous or occasionally uniseptate, 5·2 to 12·5 by 3·7 to 5·5 μ (average 8·7 by 4·4 μ), and (*b*) elongated, sub-cylindrical, slightly pedicellate, continuous to uni-, rarely biseptate, 12·5 to 23·7 by 4 to 5·5 μ. The optimum temperature for growth was from 20° to 22° C., the minimum between 3° and 8° and the maximum between 31° and 34°. The fungus is referred to the genus *Cladosporium* as *C. pisicolum* n. sp.

Inoculations gave positive results, the most severe infection occurring on Morse's 200, Laxton's Progress, and Laxtonian peas, while two (Alaska and Canada Field) were resistant. Moderate infection was secured on broad beans (*Vicia faba*) in greenhouse but not in field trials; the fungus was not pathogenic to cowpeas, *Vigna sesquipedalis*, or sweet peas. Foliar infections develop within three to seven days after inoculation under favourable conditions of high humidity and moderate temperature.

Primary infection by *C. pisicolum* may occur either through the soil or from the seeds, many of which from diseased pods show discoloured spots, and these when sown give a varying percentage of infected seedlings. Surface sterilization was not completely effective in preventing this. The presence of the fungus in the pods may induce hair-like proliferations of the inner membrane, resulting in white, felty patches extending into the pod cavity. A similar hyperplasia of the epithelial lining of the latter may arise as a result of infection by *Ascochyta pisi* [*R.A.M.*, xiii, p. 611] and *Peronospora viciae* [ibid., xii, p. 412], as well as from free moisture or mechanical agencies.

HARTER (L. L.). **A new wilt of Peas.**—*Phytopath.*, xxiv, 8, pp. 950–951, 1934.

Attention is drawn to the occurrence in various parts of the United States of an atypical form of pea wilt characterized by moderate stunting, yellowing and desiccation of the leaves, and a brick or bright red discoloration of the hypocotyl or epicotyl or both, sometimes involving most of the root but not usually extending far up the stem. Three species of *Fusarium*, differing from *F. orthoceras* var. *pisi*, the agent of common pea wilt [*R.A.M.*, xiii, p. 143], were isolated from

diseased material and determined as *F. oxysporum* var. *aurantiacum* [ibid., xi, p. 306], *F. vasinfectum* var. *lutulatum* [ibid., xiii, p. 128], and *F. redolens* [ibid., xii, p. 317]. Soil inoculations gave positive results (except with *F. redolens*, which was not common and was not tested), up to 30 per cent. of the peas planted in the infested ground developing the above-mentioned symptoms. Infection has been observed on peas in virgin soils both in the greenhouse and field, indicating the general prevalence of the causal organisms, but the incidence of the wilt is higher where peas have repeatedly occupied the same land.

PIERCE (W. H.). **Resistance to common Bean mosaic in the Great Northern field Bean.**—*Journ. Agric. Res.*, xlix, 2, pp. 183–188, 2 figs., 1934.

In continuation of his studies of bean (*Phaseolus vulgaris*) common mosaic [*R.A.M.*, xiii, p. 488], the author gives a brief account of field and greenhouse tests of nine strains of Great Northern UI field bean (a selection made in 1927 from commercial Great Northern), the results of which showed these strains to be completely immune from the disease [cf. ibid., xi, p. 561], and to possess some tolerance to yellow bean mosaic (bean virus 2) [ibid., xiii, p. 488]. Inoculation experiments did not indicate any difference in mosaic resistance among the strains, all of which significantly outyield the mosaic-susceptible common Great Northern, and three of which are now being commercially grown in Idaho.

STAPP (C.). **Die Fettfleckenkrankheit der Bohnen.** [The grease spot disease of Beans.]—*Die Kranke Pflanze*, xi, 9, pp. 97–99, 1 pl., 1934.

A popular description is given of the grease spot disease of beans [*Phaseolus vulgaris*], caused by *Pseudomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* [*R.A.M.*, xiii, p. 490], the ravages produced by which since its recognition in Germany in 1928 are stated to be very considerable. Varietal reaction trials conducted by the writer demonstrated the absolute resistance to infection of Holländischer Schwert, Allererste weisse Treibbohne [earliest of all white forcing bean], and Kaiser Wilhelm, and the virtual freedom from disease of Kronprinz, Osborn's Treib, Unerschöpfliche [Inexhaustible], Hundert für Eine, four types of Zucker Perl, Wachs Mont d'Or, and Wachs Schlachtschwert. The use of such varieties is considered to be by far the most important control measure and is strongly urged.

VERPLANCKE (G.). **Contribution à l'étude des maladies à virus filtrants de la Betterave.** [A contribution to the study of the filterable virus diseases of the Beetroot.]—*Mém. Acad. Roy. Belgique, Cl. Sci.*, Sér. II, 1451 (xiii, 1), 104 pp., 4 pl., 1 diag., 1 graph, 1934.

This is an expanded and fully tabulated account of the writer's studies in Belgium on mosaic and yellows of the beetroot, the principal results of which have already been noticed from another source [*R.A.M.*, xiii, p. 210].

Stehlík (V.). **Einfluss des Bodens auf die Anfangsentwicklung der Rübe mit besonderer Rücksicht auf die Rübenkrankheiten.** [The influence of the soil on the initial development of the Beet with special reference to Beet diseases.]—*Zeitschr. für Zuckerind.*, lviii, 50, pp. 437–444; 51, pp. 445–452; 52, pp. 453–455, 10 figs. (2 col.), 1934.

In the deep, medium-heavy, permeable, alkaline soils best adapted to beet cultivation, root rot (*Pythium de Baryanum* and *Phoma betae*) [*R.A.M.*, xiii, p. 490] is stated to be of negligible importance in Czecho-Slovakia. The disease may, however, assume a serious form in acid, encrusted soils, sometimes developing into 'girth scab' [*Actinomyces* spp.: ibid., xii, p. 25]. The physical and constitutional properties of various soil types in relation to beet culture are fully discussed.

Krüger (W.), Wimmer (G.), & Lüdecke (H.). **Beitrag zur Frage der Bekämpfung der Herz- und Trockenfäule der Zuckerrüben. Feldversuche.** [A contribution to the problem of the control of heart and dry rot of Sugar Beets. Field experiments.]—*Zeitschr. Vereins Deutsch. Zucker-Ind.*, lxxxiv, 8, pp. 507–536, 8 figs., 1934.

A comprehensive, fully tabulated account is given of a series of experiments in the control of heart and dry rot of beets [*R.A.M.*, xiii, p. 743] carried out on an estate at Wernersdorf, Silesia, from 1929 to 1932 with a by-product of soda manufacture supplied by the German Solvay Works, Ltd., Bernburg, Anhalt, and termed the 'Bernburg preventive'. It contains a high percentage of easily decomposable hydrous double silicates of lime, aluminium, and iron capable of neutralizing both acid and alkaline soils. The preventive was applied at the rate of 10, 20, or 40 doppelzentner per hect. On the whole the results of the treatment were very satisfactory, the beneficial effect on the health of the crop being apparently correlated with the correction of the excessively alkaline reaction of the soil.

Similar results were obtained in a series of tests conducted by the management of the estate with sulphur at the rate of 8 doppelzentner per hect.

Townsend (G. R.). **Bottom rot of Lettuce.**—*Cornell Agric. Exper. Stat. Memoir* 158, 46 pp., 10 figs., 3 graphs, 1934.

Bottom rot (*Rhizoctonia* [*Corticium*] *solani*) is stated to be the most important disease of lettuce in New York [*R.A.M.*, xi, p. 491], where the annual loss from this source is estimated at 30 per cent. of the crop, representing an average financial equivalent of some $500,000 per annum.

The incubation period of the disease, which is characterized by sharply defined necrotic lesions on the petioles and midribs of the basal leaves, is forty-eight hours under optimum conditions of warmth and humidity, namely, a mean daily temperature above 19·5° C. (67° F.), a daily minimum above 10° C. (50° F.), and humid weather. During the formation of the lesions, drops of an amber liquid are exuded from the tissues. Should infection be arrested before the destruction of the entire head, the lesions are transformed into sunken, chocolate-brown spots. The

leaf blade is completely disorganized by the fungus, and in severe cases all that is left of a solid head is a dry, black mummy.

The organism penetrates the leaf either through the cuticle or the stomata, and after the phase of active invasion is past it remains viable in the decayed tissue and produces sclerotia (also formed in the soil around the plant) and resistant mycelium, enabling it to survive adverse conditions. The minimum, optimum, and maximum temperatures for the growth of the lettuce strain of *C. solani* in culture are 10°, 26°, and 32° C.

Bottom rot may be effectively controlled by a single application, by a traction duster, of 20 to 25 lb. per acre of ethyl mercury phosphate, the cost of this treatment being about $15 per acre and reducing the expenditure on production by roughly 8 cents per crate, the number of which will be correspondingly increased from 500 to 700 per acre.

Wellman (F. L.). **Weather conditions associated with seasons of severe and slight Celery early-blight epidemics in Florida.**—*Phytopath.*, xxiv, 8, pp. 948–950, 1934.

In the Sanford district of Florida the most important fungous disease of the valuable celery crop is early blight (*Cercospora apii*) [*R.A.M.*, xii, p. 495]. In 1931–2 a severe epidemic occurred, whereas in 1933–4 the damage from this source was comparatively slight. Neither temperature nor rainfall differed sufficiently in the two seasons to account for this difference, which is attributed to variations in the relative amounts of fog and dew. During 1931–2 the frequent warm east winds from the Atlantic were accompanied by much fog and dew, whereas in 1933–4 cool, dry, northerly winds prevailed.

Guba (E. F.). **Control of the Verticillium wilt of Eggplant.**—*Phytopath.*, xxiv, 8, pp. 906–915, 2 figs., 1934.

None of the eggplant varieties tested at the Massachusetts Agricultural Experiment Station for resistance to wilt (*Verticillium albo-atrum*) gave any promise of being of value for the development of resistant strains, and [as previously stated: *R.A.M.*, xii, p. 494] the establishment of new plantings each year on naturally acid sod land (below P_H 5·0) appears to be the sole means of combating the disease in the field. In the greenhouse no infection occurred below P_H 5·0 where acidification was effected by aluminium sulphate, and only a slight incidence followed the use of inoculated sulphur to produce a P_H of 4·0 to 4·2, but attempts at field control by applications of these substances showed that this method is not practicable.

Bewley (W. F.) & Harnett (J.). **The cultivation of Mushrooms.**—63 pp., 6 pl., 1 fig., 11 diags., London, Shepherd & Hosking, 1934.

This little manual deals in a popular style with the practical aspects of mushroom (*Psalliota campestris* and *P. arvensis*) cultivation in England, including brief notes on the occurrence and control of pests and diseases [*R.A.M.*, xiii, pp. 213, 286]. In addition to a brief description of the mushroom, with a discussion of the various types of spawn in past and present use, chapters are devoted to the adaptation or construction of sheds, glasshouses, frames, caves and tunnels, and ridge beds;

the preparation, spawning, and casing of the beds; and care of the beds, picking, grading, and packing.

FERRARIS (T.). **Brevi note fitopatologiche di stagione.** [Short seasonal phytopathological notes.]—*Rivista Agricola*, xxx, 689, pp. 296–297, 1934.

Between 10th and 20th June, 1934, owing to rainy periods followed by hot spells, with frequent morning mists in low-lying districts, vine mildew [*Plasmopara viticola*] was very severe on the fruit clusters in northern Italy, the yield in some localities being reduced by at least one-third in spite of the usual treatments. The author recommends the addition to 1·5 per cent. Bordeaux mixture of ammonium chloride at the rate of 125 to 150 gm. per hectol. [*R.A.M.*, x, p. 245]. The weather also favoured vine *Oidium* [*Uncinula necator*], for the control of which the author urges the use of natural sulphur dusts with copper ('zolfi gregi ramati') [ibid., viii, pp. 545, 701], which are very adhesive and do not cause scorching.

CHEVALIER (G.). **Les bouillies cupro-ammoniacales.** [Cupro-ammoniacal mixtures.]—*Prog. Agric. et Vitic.*, cii, 28, p. 62, 1934.

Prompted by the recent increase in the interest shown by vine-growers in cupro-ammoniacal mixtures [*R.A.M.*, xiii, p. 354] for the control of vine mildew [*Plasmopara viticola*], the author determined the copper content at varying periods after preparation of ordinary Burgundy mixture and of the same mixture to which 1·5 kg. ammonium sulphate [per 100 l.] was added either before or after incorporating the soda solution in the copper sulphate solution. The results showed that while the ordinary Burgundy mixture contained 560 and 229 mg. dissolved copper [per litre] after six and thirty hours, respectively, that to which the ammonium sulphate was added directly to the copper sulphate solution contained 1,499 and 410 mg., and that in which the ammonium sulphate was added after mixing the copper sulphate and soda solutions contained 1,090 and 408 mg. dissolved copper, respectively.

While providing an explanation for the favour shown to the cupro-ammoniacal mixtures in practice, these findings also support Branas's and Dulac's views [ibid., xiii, p. 645] that the efficacy of copper-containing mixtures against vine mildew is mainly determined by their content in dissolved copper.

ARMET (H.). **Les bouillies célestes au sulfate d'ammoniaque et solutions cupriques aux composés tartriques.** ['Bouillies célestes' with ammonium sulphate, and cupric solutions with tartaric compounds.]—*Prog. Agric. et Vitic.*, cii, 26, pp. 19–23; 27, pp. 45–47; 29, pp. 86–89, 1934.

After a brief reference to the preparation of 'eau céleste', which was first applied in 1886 to the control of vine mildew [*Plasmopara viticola*] in France, and to its advantages and defects, especially its scorching effect on the vine foliage, the author describes the preparation of a

mixture (termed by him 'bouillie céleste' normale), the basic formula of which is 1 kg. copper sulphate, 1·4 kg. carbonate of soda, and 1 kg. ammonium sulphate per 100 l. water [cf. *R.A.M.*, xiii, p. 354]. Stronger concentrations may be obtained by multiplying the weights of all the constituents by a common multiple. This formula gives a maximum of dissolved cuprammonium hydrate in the mixture, but where the simultaneous presence in the latter of soluble ammoniacal copper and of colloidal copper is desired, the doses of carbonate of soda and ammonium sulphate may be reduced. This mixture possesses the same capacity of dissolving cellulose as 'eau céleste', but does not scorch the vine leaves, and is easier and quicker to prepare. It is more fluid and more wetting than the ordinary Burgundy mixture, requiring an expenditure of spray liquid superior to that of the latter by 20 to 25 per cent., thus compensating for the reduction in the copper content of the mixture. Small-scale trials in 1927 indicated that it was decidedly more efficacious than the ordinary copper-containing mixtures, and at least as effective as neutral copper acetate solutions. It is recommended not to use ammonium sulphate produced by gas works, because of the impurities contained in it.

Of equal efficacy in the control of *P. viticola* is stated to be another mixture with the basic formula 1 kg. copper sulphate, 750 gm. neutral potassium tartrate, and 500 gm. carbonate of soda. An additional advantage of this mixture is the fact that it may promote the growth of the vine leaves by supplying the latter with ready-made tartaric acid, a compound which is normally elaborated by the vine foliage.

VENKATARAYAN (S. V.). **Are sprayed Grapes poisonous?**—*Journ. Mysore Agric. & Exper. Union*, xiv, pp. 22–24, 1933. [Abs. in *Chem. Abstracts*, xxviii, 19, p. 6211, 1934.]

Grapes sprayed with Bordeaux mixture against pathogenic organisms [in India] were found to contain about 2·5 to 3 mg. copper per kg., an amount only slightly (0·5 to 1 mg.) in excess of the maximum detected in untreated fruit. There can be no risk of poisoning from the consumption of the disinfected product [cf. next abstract].

BENVEGNIN (L.) & CAPT (E.). **Influence des traitements cupriques sur la valeur hygiénique des produits de la Vigne.** [The influence of copper treatments on the hygienic value of the products of the Vine.]—*Annuaire Agric. de la Suisse*, xxxv, 6, pp. 667–682, 1934. [German summary.]

It was shown by analytical studies [the results of which are discussed and tabulated] at the Lausanne Viticultural Experiment Station that the amount of fungicidal copper actually found in the wine prepared from Bordeaux-treated vines is infinitesimal (0·5 mg. per l. after six months' storage) and completely uninjurious to health [cf. preceding abstract]. The copper content of the wine after fermentation is completed is ordinarily not correlated with that in the grape must, while that in the latter is much less than the copper adhering to the surface of the grapes, e.g., when the vines have received a late treatment.

Rapport sur le fonctionnement de l'Institut des Recherches Agronomiques pendant l'année 1933. [Report on the work done by the Institute of Agronomic Researches during the year 1933.]—195 pp., Paris, Imprimerie Nationale, 1934.

The following are among the many items of phytopathological interest contained in this report. Experiments at Versailles and elsewhere in France failed to confirm the view that susceptibility to degeneration diseases is less marked in potato 'seed' of mountain origin than in equally healthy and clean seed obtained from low-lying districts [*R.A.M.*, xiii, pp. 178, 535].

Rainfall was not an indispensable condition for germination of the oospores of vine mildew (*Plasmopara viticola*), which in 1933 was induced by high temperatures and an atmospheric humidity approaching saturation [cf. ibid., xiii, pp. 149, 678]. Under the weather conditions that prevailed during the year, Cabernet Sauvignon vines at Grande-Ferrade which received the full treatment recommended by the Station d'avertissements agricole at Bordeaux against *P. viticola* gave a yield taken as 100 per cent., as against 88 per cent. for those given one treatment between 15th June and 1st July, 84 per cent. for those given one treatment between 15th May and 15th June, 58 per cent. for those given one treatment between 1st and 20th May or 1st and 31st July, and 40 per cent. for those left untreated; thus, the yield of the latter was reduced by 60 per cent. although the year was not favourable to mildew. The herbaceous organs of Paulme vines affected with deformation-anthracnose contained a mycelium apparently analogous with that described by Ranghiano in court-noué [ibid., xiii, p. 616]; it was characterized by intercellular hyphae of varying diameter, sometimes swollen into round vesicles of very unequal size.

The different degrees of infection by *Puccinia glumarum*, *P. triticina*, and *P. graminis* on a large number of wheat varieties at Colmar are tabulated; in another test the last-named attacked none of the wheats severely, and failed to infect Mentana.

A comparison of the virulence of bunt [*Tilletia caries*] strains from different localities on Bon Fermier, B 2, and Red Hussar wheat showed that maximum infection was produced on the first by strains from Colmar, Breslau, and the Ardennes, on the second by those from the Aisne, Colmar, and Breslau, and on the third by strains from Breslau and Cassel.

Of a large collection of Cucurbitaceae the only ones that remained unaffected by *Erysiphe cichoracearum* [ibid., xiii, p. 419] were *Cucurbita moschata* and *Benincasa cerifera*. *Verticillium dahliae* and *Pythium megalacanthum* were isolated from melons showing a wilt and collar canker [ibid., iv, p. 495; vii, p. 180; xii, p. 731]; inoculations with pure cultures of the two fungi gave positive results only with the latter.

Attempts to establish whether seed transmission of bean mosaic [ibid., xii, pp. 413, 741; xiii, p. 489] occurs gave inconclusive results; under the experimental conditions the Nain de Chevilly variety remained practically unaffected.

Rhizoctonia [*Corticium*] *solani* was isolated from rotted *Stachys affinis* [crosnes or Japanese artichoke] plants.

Evidence was obtained by Mlle Frémont at Lille that plants attacked by parasites react by the formation of agglutinants and precipitins; broad bean [*Vicia faba*] tissues after repeated injections of *Bacillus proteus* showed the presence of an antibody analogous to the lysin-producing principle which develops in animal organisms treated with the same antigen [cf. ibid., xiii, p. 177]. Plants into which an organism is inoculated do not contain vaccinating substances for the organism, but on the contrary their extracts augment its virulence.

Plantesygdomme i Danmark 1933. Oversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1933. Survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. for Planteavl*, xl, 2, pp. 258–300, 3 figs., 2 graphs, 1934. [English summary.]

The usual lines have been followed by E. Gram and his collaborators in the compilation of this report [*R.A.M.*, xiii, p. 151], which includes the following new records for Denmark. One case of mosaic in Spanish pepper [*Capsicum annuum*: ibid., xii, pp. 354, 759] was observed, and the same disorder is believed to have been responsible for stunting and leaf curl of potted *Myosotis* plants. *Bacterium sojae* [ibid., xi, p. 315] caused a leaf spot of soy-bean plants cultivated experimentally in various parts of the country. Leaf spots caused by *Phytomonas berberidis* [ibid., xi, p. 109] were observed on *Berberis vulgaris*, *B. canadensis*, *B. crataegina*, and *B. chilensis*.

Jahresbericht der Preussichen landwirtschaftlichen Versuchs- und Forschungsanstalten in Landsberg (Warthe) für das Jahr 1933. [Annual Report of the Prussian Agricultural Experiment and Research Stations at Landsberg (Warthe) for the year 1933.]—*Landw. Jahrb.*, lxxix (Supplement), pp. 1–33, 1934.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xiii, p. 9]. Reference is made, in connexion with an account of the potato degeneration studies in progress on five different soil types, to Hey's electrometrical method of gauging deterioration and also to the use of a 0·2 per cent. mercuric chloride solution and rhodamin for this purpose, the principle here being analogous to that involved in Bechhold's copper strip test [ibid., xiii, p. 649].

As wart [*Synchytrium endobioticum*]-resistant substitutes for Industrie the varieties Ackersegen, Erdgold, and Preussen are specially recommended [cf. ibid., xiii, pp. 467, 590]; for Deodara on light soils Sickingen and Stärkereiche [Starchy] I; for Wohltmann on medium and light soils Rotweissragis and on medium to rich soils Robinia.

Efforts were made to discover a substitute for formalin and its polymerization products as a means of combating tomato leaf mould (*Cladosporium fulvum*), these substances, though highly efficacious, being liable to cause severe injury to the plants in ordinary practice. Promising results have been obtained in preliminary tests with certain phenoxy-compounds, the caustic action of which is strictly confined to the area of the mesophyll permeated by the mycelium of the fungus. A few greenhouse plants that remained immune from an attack of leaf

mould destroying the bulk of the crop are being very successfully used for propagation [cf. ibid., xiii, p. 405].

Bericht der Lehr- und Forschungsanstalt für Wein-, Obst-, und Gartenbau zu Geisenheim a. Rh. für das Rechnungsjahr 1933. [Report of the Viticultural, Fruit Growing, and Horticultural College and Research Institute at Geisenheim-am-Rhein for the financial year 1933.]—*Landw. Jahrb.*, lxxix (Supplement), pp. 166–195, 1934.

This report contains the following notes on phytopathological subjects [cf. *R.A.M.*, xiii, p. 9]. Heavy damage was caused during the period under review by the ordinarily unimportant white spot disease of pears (*Mycosphaerella sentina*) [ibid., xi, p. 694], which specially affected the Beurré Clairgeau, Olivier de Serres, Beurré Diel, and Williams's Bon Chrêtien varieties. By the middle of August the diseased trees were more or less defoliated.

Good results were obtained with the following preparations tested on behalf of the pest control committee of the German Viticultural Association against *Peronospora* of the vine [*Plasmopara viticola*]: 1 per cent. cuprosa (Gebr. Borchers A.G., Goslar) [ibid., xiii, p. 449], G. 33 and 1 per cent. copper dust (Wacker, Munich), 1 per cent. Sch. 1132 and Ob 21 (I. G. Farbenindustrie A.G., Höchst-am-Main). Against the combined attacks of *P. viticola* and the vine moths [*Clysia ambiguella* and *Polychrosis botrana*] Silesia copper dust (Güttler & Co., Hamburg) was effective, while Wacker's Bordeaux mixture proved useful in the control of pear *Fusicladium* [*Venturia pirina*].

It was ascertained by means of a newly constructed actinometer that such dark-coloured disinfectants as nosperal, nosperit, nosprasen, and nosprasit [cf. ibid., xii, p. 383 *et passim*] cut off much more sunlight from the sprayed vine leaves than pale ones, e.g., urania green-Bordeaux, Wacker's Bordeaux, Spiess copper arsenate, and the like. When applied in excess, the dark-coloured preparations may cause a loss of 50 per cent. of the rays, with serious consequences to the quality and maturation of the fruit.

The anatomical examination of poorly developed Riparia × Rupestris 101^{14} M.G. vine stocks revealed the almost constant presence of the intracellular cordons characteristic of the 'roncet' disease [ibid., xiii, p. 616], of which the feeble habit of growth is in all probability a precursor. A thorough inspection of 40 Rhenish and neighbouring vineyards showed that weak development and short nodes [court-noué] are very prevalent among 101^{14} M.G. vines and to a somewhat lesser extent in Riparia × Rupestris 3309 C; these external symptoms (which are not apparent on Kober 5 BB) were accompanied in all the cases where detailed observation was possible by the presence in the tissues of intracellular inclusions. The question of roncet control is complicated by the fact that the intracellular bodies are not consistently associated with the disease, and the eradication of otherwise vigorous stocks merely on account of their presence cannot (pending further investigations) be justified. In all cases, however, where weak growth and intracellular inclusions coincide, the removal of the affected vines is clearly indicated.

McRae (W.). **Report of the Imperial Mycologist.**—*Scient. Repts. Imper. Inst. Agric. Res., Pusa, 1932–33*, pp. 134–160, 1934.

The following are among the numerous items of interest in this report of the phytopathological work carried out during 1932–3 at the Imperial Institute of Agricultural Research, Pusa, India. In July, 1932, a survey of the sugar-cane plantations of North Bihar was made to ascertain the intensity of mosaic, which was found to range on the Coimbatore varieties almost exclusively grown in the district from 0·09 to 0·7 per cent. [*R.A.M.*, xiii, p. 268]. The fungus responsible for top rot of sugar-cane at Pusa has been identified as *Fusarium moniliforme* [*Gibberella moniliformis*: ibid., xi, p. 425], the pathogenicity of which was established by inoculations resulting in the typical symptoms of the disease. Further studies by M. Mitra on the *Helminthosporium* disease of sugar-cane involved the comparison of one strain of the fungus from Allahabad and two from Bombay with *H. sacchari* [ibid., x, pp. 437, 759; xiii, p. 12]. Morphologically the three forms were found to be closely related and probably merely local strains of *H. sacchari*. *Rhizoctonia bataticola* [*Macrophomina phaseoli*] was observed on sugar-canes at Pusa.

A species of *Cephalosporium* was isolated from the nodes of sterile rice plants in sporadic patches at the Cuttack Farm [cf. ibid., x, p. 336], and inoculation experiments to test its pathogenicity are in progress.

An apparently undescribed species of *Cercospora* was isolated from dark brown, elongated spots mainly on the under surface of the leaves of *Cannabis sativa*, which in severe cases are almost destroyed by the enlargement and coalescence of the spots.

A species of *Sclerospora* was recorded for the first time on *Panicum trypheron* and found to agree in morphological characters with *S. sorghi* [ibid., xi, p. 635].

Tilletia indica Mitra [ibid., xi, p. 425] was found in a virulent form at Karnal (Punjab) causing up to 20 per cent. damage on a number of wheat varieties. This smut, like *T. tritici* [*T. caries*], has a distinctly fishy smell [ibid., xii, p. 277], but unlike the latter it rarely infects more than a few spikelets on each ear.

Uspulun again gave effective control of *Helminthosporium sativum* and *H. teres* on barley [ibid., xii, p. 13] and also checked *Ustilago hordei* on the same host. In the T. 21 variety the percentage of *Helminthosporium* attack was reduced by it from 4·72 to 0·05 and of covered smut from 1·5 to nil. Cawnpore 251 and 252 barleys were the only two attacked by both species of *Helminthosporium*, whereas all but one of the nine varieties grown were affected by *H. teres*.

Negative results were given by pot and plot inoculation experiments on chilli with eight strains of *Fusarium* suspected of responsibility for wilt disease of this crop [ibid., xi, p. 426].

McRae (W.). **India: new diseases reported during the year 1933.**—*Internat. Bull. of Plant Protect.*, viii, 9, pp. 199–202, 1934.

Rice was observed to be infected during 1933 by the A form of *Rhizoctonia bataticola* [*R. lamellifera*: *R.A.M.*, xii, p. 727], while in Madras (according to S. Sundararaman) the same crop was attacked by *Fusarium moniliforme* var. *majus* [ibid., xii, p. 590; xiii, p. 323], which

caused a foot rot of the affected plants. Seed disinfection controlled the disease. Sugar-cane in Burma was infected by *Cercospora kopkei* [ibid., xiii, p. 686]. J. F. Dastur reported an attack of spotted wilt on tomatoes in the Central Provinces. S. L. Ajrekar found that spore balls of *Tolyposporium penicillariae* [*Ustilago penniseti*: ibid., xii, p. 367] lying in the fields are the sole source of infection on *Pennisetum typhoideum*, the flowers of which are alone subject to invasion. S. Sundararaman investigated a citrus disease in the Salem district of Madras characterized by gradual dwarfing and chlorosis of the foliage (excluding the veins), a crowded appearance of the crown due to a profusion of small twigs, stunting of the fruits, and progressive die-back of twigs and branches. The disorder appears to be closely allied to, or identical with, mottle leaf [ibid., xiii, p. 573].

TEMPANY (H. A.). **Annual Report, Department of Agriculture, Straits Settlements and Federated Malay States, for the year 1933.**—60 pp., 1934.

In the section of this report dealing with the work of the Mycological Division [by A. Thompson] it is stated that oil palm stem rot [*Fomes noxius*: *R.A.M.*, xiii, p. 215] is most prevalent in Malaya on poorly growing palms but that it easily spreads, if unchecked, to more vigorous ones. The disease, however, progresses so slowly that inspections at intervals of six months followed by applications of the usual control measures where necessary should suffice to check it. Charcoal base rot of oil palms (the cause of which is being investigated) occurred in two localities.

Tapioca [*Manihot utilissima*] tubers developed a rot due to *F. lignosus*.

Pisang Embun bananas at Bentong were affected by Panama disease (*Fusarium* [*oxysporum*] *cubense*) [ibid., xiii, p. 586].

Pythium aphanidermatum caused a collar disease of tomatoes [ibid., xiii, p. 194].

HANSFORD (C. G.). **Annual Report of Mycologist, 1933.**—*Ann. Rept. Dept. of Agric. Uganda, for the year ended 31st December, 1933* (Part II), pp. 48–51, 1934.

During the period under review, blast (*Piricularia* sp.) of *Eleusine coracana* [*R.A.M.*, ii, p. 259; xii, pp. 77, 395] was very prevalent at Serere, Uganda, as well as in the local native plots. It was most prominent early in the season on the leaves, on which it produced rounded or lenticular spots with a central grey to pale olive area underneath; when these extended across the base of the leaf, the distal part withered. Later, the culms were attacked, usually just inside one or more of the leaf sheaths, where an elongated, greyish, subsequently brown to blackish-brown spot appeared, involving most of the culm tissues at the point of attack. Affected culms of the more slender types of *E. coracana* often collapsed. Much of the culm infection occurred two or three inches below the head, which was often killed. In other instances, infection took place near the base of one or more 'fingers', which failed

to develop further, though the rest of the head might grow normally. Affected plants in poor soil remained stunted and unproductive. The disease also affected smaller native grasses, especially a species of *Digitaria*. *Gibberella saubinetii* attacked the base of a number of *E. coracana* plants, infection usually occurring in patches, especially on poor soil.

In an Appendix a full account is given of an experiment carried out in the course of the cotton blackarm (*Bacterium malvacearum*) investigations at Serere [ibid., xiii, p. 289, and below, p. 97], in which strips of S.G. 29 and S.P. 1 (a selection from the South African U. 4/4/2) cotton were sown on 26th May, 19th June, 12th July, and 12th August from untreated seed and seed treated either with abavit B or 413a dust. The best germination was obtained from the last-named treatment, with an average increase of 6·5 per cent. over the controls. The seed treated with abavit B had a lower percentage of germination than the controls. The seed dusted with 413a also gave a significantly better yield than the untreated seed, the lowest significant difference being 23·8 lb. per acre; on S.G. 29 this treatment increased the yield by 16 per cent. as compared with the controls.

As regards primary infection, May was significantly the worst date of sowing; the June sowings developed more primary infection than the August ones, but there was no significant difference between July and August. In secondary leaf infection there was no significant difference between the various dates. On the whole the earlier sowings gave better yields than the later ones and seed treatment had more effect on the former than on the latter. Both the angular leaf spot and stem form of blackarm spread much more rapidly in the later sowings than in the earlier ones.

S.G. 29 showed much heavier primary and secondary leaf infection than did S.P. 1, while stem lesions on the former were often much more extensive and remained active longer than those on the latter. The evidence indicated that under weather conditions highly conducive to the spread of the disease the resistance of S.P. 1 can be modified, though it always remains more resistant than S.G. 29, which also gave a much smaller yield.

The cotton wilt previously reported [ibid., xi, p. 353] was increasingly prevalent; the disease was associated with a *Fusarium*, probably *F. vasinfectum*.

Groundnuts were attacked by *Sclerotium rolfsii*, *Rhizoctonia bataticola* [*Macrophomina phaseoli*], and a *Fusarium*, causing wilt diseases with similar symptoms. A leaf spot marked by larger, more diffuse spots than those due to *Cercospora personata* and by the absence of brownish-black conidiophores was caused on the same host by *C. arachidis* [*C. arachidicola*: ibid., xiii, p. 747].

A serious mosaic disease of *Phaseolus* sp. occurred at Serere, the affected plants being stunted, with thickened, wrinkled, curled leaves, and practically no crop. Soy-beans showed a similar condition, unaccompanied, however, by any diminution in yield.

The disease of *Dolichos lablab* previously reported as due to a *Sphaceloma* [ibid., xiii, p. 290] recurred, *Canavalia ensiformis*, but no other legume, also being attacked.

Nattrass (R. M.). **Annual Report of the Mycologist for the year 1933.**—*Ann. Rept. Dept. of Agric. Cyprus for the year 1933*, pp. 48–57, 2 figs., 1934.

Wheat flag smut (*Urocystis tritici*) was more prevalent in Cyprus in 1933 than in the previous year [*R.A.M.*, xiii, p. 568], irrigated crops being the most severely attacked. The *Cercospora* previously recorded on *Vicia faba* as *C. fabae* [ibid., xii, p. 747] was identified at the Imperial Mycological Institute as *C. zonata*. Attack by *Macrophomina phaseoli* was general and severe on *Phaseolus vulgaris* in most districts, the fungus also causing a root and collar rot of *Vigna* spp. in one area, as well as an almost complete failure of potatoes in the Amiandos-Agros district; it was found, besides, on eggplant, sesame [ibid., xii, p. 267], red currant, *Hibiscus esculentus*, and tomato.

In many of the potato crops of the Mesaoria heavy losses were caused by a virus disease the symptoms of which corresponded with those of streak, while there was also a sudden, widespread appearance of powdery mildew caused by a fungus morphologically resembling *Erysiphe cichoracearum*, the conidia of which measured 25 to 29 by 12 to 14 μ [ibid., viii, p. 150].

Deuterophoma tracheiphila was isolated from the twigs of lemon trees affected with 'mal secco' [ibid., xii, p. 747]; the disease appears to be widespread in Cyprus. From a gummosis and canker of the scion of a freshly planted orange tree a form of *Fusarium lateritium* [ibid., xiii, p. 108] was isolated. What appears to be the same fungus has been found forming pink sporodochia on cankers round the graft union of young oranges.

An investigation was made of a gummosis of the main branches and upper part of the trunk of lemon trees, extending from a few inches to 2 ft. or more and sometimes leading to the drying-out and splitting of the bark. Isolations yielded a fungus [the cultural characters of which are described] which produced a pycnidial stage referable to *Dothiorella* and perithecia resembling *Botryosphaeria* or allied forms but not fully identified as yet. The fungus is capable of causing a slow rot of lemon fruit. From one case of gummosis of the upper branch of a lemon tree with similar symptoms, isolations yielded a *Torula* apparently identical with the *Torula* form of *Hendersonula toruloidea* as described from deciduous trees in Egypt [ibid., xiii, p. 382]. The same fungus was also found on mature *Populus nigra* trees that had died in late summer in the Nicosia district; in November, the bark of the main branches began to peel, exposing a black layer of the *Torula*. The organism was also found, though with a less copious thallospore production, on figs and walnuts.

Poria friesiana was observed, apparently mildly parasitic, on orange trees in an old-established orchard. Olive fruits were attacked by *Macrophoma dalmatica* [ibid., xii, p. 707], apparently the first record of this fungus in Cyprus. *Oidiopsis taurica* was general and severe on tomatoes [ibid., xii, p. 748], often, apparently, in association with a virus disease of the 'fern-leaf' type [see below, p. 108], and was also general on lucerne in the coastal regions, besides being found on *Foeniculum* and *Nicotiana* sp. Perithecia were found on *Foeniculum* and lucerne.

From galls on *Myrtus communis* (commonly affected by this disease in the north coastal region) a *Pestalozzia* was isolated, the 4-septate spores of which measured 27 to 29 by 4 to 6 μ and had 2 or 3 cilia; the fungus agreed on the whole with *P. decolorata*, to which it is provisionally referred. It may possibly cause the gall production [cf. ibid., iv, p. 249].

SHEPHERD (E. F. S.). **Botanical and Mycological Division.**—*Ann. Rept. Mauritius Dept. of Agric. for 1933*, pp. 21–23, 1934.

A fairly severe outbreak of 'fourth disease', the etiology of which is still obscure [*R.A.M.*, xiii, p. 653], occurred in six-months-old virgin sugar-cane of the B.H. 10(12) variety in the Moka district of Mauritius in May, 1933. Experiments in the transmission of the disorder through infected cuttings are in progress. Pokkah-boeng (*Fusarium moniliforme*) [*Gibberella moniliformis*: ibid., xiv, p. 58] was prevalent on P.O.J. 2725 and 2878, but infection was confined to the leaves and no deaths resulted.

A pineapple wilt was found to be associated with the mealy bug, *Pseudococcus brevipes* [ibid., xiii, p. 586]. At Long Mountain the dry side rot of pineapple fruit and the crown rot reported in 1932 occurred in a serious form; both the Queen and Smooth Cayenne varieties are affected by the former condition while the latter is restricted to Smooth Cayenne.

Bouisol was found to be equally effective with Bordeaux mixture in the control of potato blight (*Phytophthora infestans*) [cf. ibid., xiii, p. 121], easier of preparation, and slightly cheaper. Scab (*Actinomyces scabies*) occurred in a restricted area at Rose Hill.

The application of Cheshunt compound [ibid., i, p. 373] was recommended against a *Pythium* rot of tea seedlings.

A wilt (apparently bacterial) of Dwarf bananas [cf. ibid., xiii, p. 713] was reported from Long Mountain.

[WALTERS (E. A.).] **Report on the Agricultural Department, St. Lucia, 1933.**—51 pp., 1 pl., 2 graphs, 1934.

In the section of this report dealing with plant diseases (pp. 18–19) it is stated that owing to the absence of any well-defined dry season after the wet weather of the previous year, blossom blight (*Gloeosporium limetticolum*) was prevalent in St. Lucia in 1933 and affected the crop rather seriously [*R.A.M.*, xii, p. 689].

The raising of nursery seedlings on new land and in drier localities has practically eliminated all fear of severe outbreaks of scab [*Sporotrichum citri* or *Sphaceloma fawcettii*: loc. cit.] of sour orange [*Citrus aurantium* var. *bigaradia*], while the careful removal and destruction of even slightly infected material has kept the disease under control.

In cacao fields partially abandoned owing to the depressed condition of the market, *Rosellinia* root disease [*R. bunodes* and *R. pepo*: ibid., xi, pp. 26, 698] spreads rapidly. In many cases these fields have been replanted with limes, grapefruit, or coco-nuts. There is no well-authenticated instance of *Rosellinia* invading the uninjured roots of sour orange in St. Lucia, but the fungus is known to invade the wounded roots of this host.

Forty-sixth Annual Report of the Kentucky Agricultural Experiment Station for the year 1933. Part I.—69 pp., 1934.

In an experiment carried out in Kentucky, tobacco stalks inoculated the previous summer with yellow and green mosaic were chopped up, spread on two separate plots and 'disked in' shortly before planting. In an adjacent control plot 368 plants remained healthy for 83 days, when the experiment was discontinued; in the yellow mosaic plot 1·5 and 3 per cent. of the plants developed yellow and green mosaic, respectively; in the green mosaic plot 6·5 per cent. developed green mosaic [*R.A.M.*, xiii, pp. 13, 729]. Mosaic was not carried over during the winter on the roots of infected tobacco left in the field.

In an attempt to develop White Burley varieties resistant to *Fusarium* wilt [*F. oxysporum* var. *nicotianae*: ibid., i, p. 321; vi, pp. 262, 440], 1025 F_2 hybrids between resistant Turkish and susceptible White Burley tobacco segregated into 272 resistant and 753 susceptible lines when inoculated and planted in the field, indicating that resistance is a simple Mendelian recessive. Tobacco varieties ascertained to be practically immune from wilt are Pennsylvania Havana 18, Turkish, and the so-called nicotine-free Havana and Cuba tobaccos developed by Dr. Baur in Berlin.

Extensive inoculation studies with *Bacterium angulatum* [ibid., xiii, p. 14] and *Bact. tabacum* proved that as tobacco leaves age resistance increases until virtual immunity results; the change from extreme susceptibility to resistance takes place in seedlings in a few days. With few exceptions tobacco seed remained free from *Bact. angulatum* even when the pods were inoculated 17 times, provided that the inoculations ceased before they split open.

First crop shoots of first and second year Kentucky-adapted clovers were highly susceptible to, but were not killed by, *Gloeosporium caulivorum* [*Kabatiella caulivora*: ibid., xii, p. 78]. *Colletotrichum destructivum* [ibid., vi, p. 100] is rather common on clover and lucerne varieties in Kentucky, but is only mildly pathogenic to red clovers from various localities. *C. cereale* frequently fruits on dying and dead clover.

An apparently undescribed disease of clover referred to as 'black-patch' and observed in Kentucky for several years past is caused by a septate, dark brown, sterile fungus which produces large black lesions on the leaf surfaces. It occurs on white and red clover in distinct patches during damp weather or on individual plants under unfavourable conditions.

TISDALE (W. B.). **Plant pathology.**—*Ann. Rept. Florida Agric. Exper. Stat. for the fiscal year ending June 30, 1933*, pp. 110–126, [1934].

A. H. Eddins states that in 1933 *Bacterium solanacearum* caused 4 per cent. loss on 1,300 acres of potatoes in northern Florida; in one five-acre field the disease caused a loss of 40 per cent., ranking next to late blight [*Phytophthora infestans*] in the production of tuber rot. Inoculated sulphur applied at the rate of 800 lb. per acre gave good control in one locality, where smaller amounts were less effective and

larger ones reduced the yield. In another area where a small percentage of wilt was present 600 lb. per acre was most effective, while in a third district, where the disease was very rife 400 lb. per acre gave the smallest reduction in yield but a larger percentage of wilt than the heavier applications, which materially reduced the yield.

Observations by R. K. Voorhees showed that, as in every year since 1928, *Diplodia zeae* ranked first, *D. macrospora* second, and *D. frumenti* [*Physalospora zeicola*: *R.A.M.*, xii, p. 366] third in causing seedling, stalk, and ear rot diseases of maize [ibid., ix, p. 712].

Experiments by M. N. Walker in soil temperature tanks showed that the most favourable temperature for the development of *Fusarium* wilt of watermelons [*F. niveum*: ibid., xii, p. 495; xiii, p. 560] is about 27° C.; the fungus caused abundant injuries at all temperatures down to 18°, at which point the germination of the seed was very definitely retarded. At temperatures over 30° practically no wilt occurred; this temperature was the lower limit for the most rapid growth of watermelon plants.

Further investigations by A. S. Rhoads demonstrated 82 different species of plants, including a wide variety of fruit, forest, and ornamental trees, shrubs, and vines to be attacked by *Clitocybe tabescens* [ibid., iv, p. 585; xii, p. 680]. Comparison of the fungus with numerous isolations of *Armillaria mellea* from different countries showed that although the rhizomorphs of both organisms are very similar the mycelial growth characters are quite different. Further, the mycelium of *A. mellea* and *A. fuscipes* [ibid., x, p. 525] is generally phosphorescent in the dark, a character absent from the many cultures of *C. tabescens* examined.

Studies by W. B. Tisdale and E. West on stem-end rot of stored citrus fruits due to *Diplodia natalensis* [ibid., xiii, p. 26; xiv, p. 30] showed that the optimum temperature for infection and decay was between 26° and 29°, this temperature coinciding with the optimum for growth of the fungus in culture. At this temperature decay became apparent five days after the spores had been placed on freshly cut ends of the buttons. No decay developed from similar inoculations in 18 days at 13° or 40°. Spraying in the grove had a direct effect on the percentage of fruit decay that developed in storage. In one experiment, pineapple oranges from unsprayed control trees developed 68 per cent. total decay, 27 per cent. of which was due to *D. natalensis*, the corresponding figures for the fruit from trees sprayed with colloidal sulphur and lime-sulphur plus lime being, respectively, 39 per cent. and 12 per cent., and 55 per cent. and 17 per cent. Valencia oranges similarly treated showed smaller differences in the percentages of decay.

W. B. Tisdale and S. Hawkins state that during the past two years growers in the lower east coast section of Florida have sustained heavy losses from a trunk-girdling disease of limes [*Citrus medica*] caused by a *Diplodia* and another fungus.

G. F. Weber found that loss of fruit in citrus groves was caused by *Nematospora coryli* [ibid., xiii, p. 337], consignments of tomatoes also showing up to 4 per cent. infection. Inoculation tests showed that *N. gossypii* developed less rapidly than *N. coryli* and caused less rapid decay than the latter both in tomatoes and citrus fruit.

MÜLLER (A. S.). **Brazil: preliminary list of diseases of plants in the State of Minas Geraes.**—*Internat. Bull. of Plant Protect.*, viii, 9, pp. 193–198, 1934.

Among the diseases affecting economic crops in the State of Minas Geraes, Brazil, may be mentioned *Macrosporium nigricans* [*R.A.M.*, ix, p. 489] and *Verticillium albo-atrum* on cotton [ibid., xiii, p. 632]; *Cercospora cordobensis*, *Phyllosticta batatas* [ibid., x, p. 268; xii, p. 553], and *Monilochaetes infuscans* on sweet potato; *C. solanicola* [ibid., ix, p. 227] on potato; *C. longipes* on sugar-cane [ibid., xii, pp. 39, 467]; *C. cruenta* on cowpea [ibid., xii, p. 725]; *C. canescens* [ibid., xi, pp. 130, 431] and *C. columnaris* [*Isariopsis griseola*: ibid., xii, pp. 2, 680] on beans (*Phaseolus vulgaris*); *Bacterium sojae* on soy-bean [see above, p. 78]; *Bact. tabacum* on tobacco; *Clasterosporium müllerii* on sunflower (*Helianthus annuus*); *Oidium manihotis* Averna-Saccá on *Manihot* spp.; *Cercospora grandissima* [ibid., vii, p. 765] on artichoke (*Cynara scolymus*); *Aplanobacter* [*Bacterium*] *stizolobii* on *Stizolobium deeringianum* [ibid., vii, p. 642]; *Phytophthora parasitica* on peas; *Bacterium pruni* on peach and other species of *Prunus* [ibid., xiii, p. 564]; and *Phoma uvicola* [*Guignardia bidwellii*: ibid., iii, p. 746] on *Vitis* spp.

BUTLER (E. J.). **Note on the incidence of Cacao diseases in the British Colonial Empire and the steps being taken to investigate and control them.**—*Bull. Officiel, Office Internat. des Fabric. de Chocolat et de Cacao*, iv, 3, pp. 121–125, 1934. [French translation.]

Short, popular notes are given briefly reviewing (with reference to some of the more important papers on the subject) the present situation as regards the prevalence, relative importance, and control of the cacao diseases found in the British Empire, viz., canker and black pod (*Phytophthora palmivora*) [*R.A.M.*, xi, p. 701]; witches' broom (*Marasmius perniciosus*) [ibid., xiii, p. 359]; black root (*Rosellinia* spp.) [see above, p. 84]; *Fomes* root diseases caused by *F. lignosus*, *F. noxius*, and possibly other species of this genus; red root (*Sphaerostilbe repens*); collar crack (*Armillaria mellea*) [ibid., vi, p. 659]; collar rot (*Ustulina zonata*); pink disease (*Corticium salmonicolor*); die-back and brown pod rot (*Botryodiplodia theobromae*), considered to be usually secondary to *P. palmivora* or some other primary trouble; mealy pod (*Trachysphaera fructigena*) [ibid., xi, p. 701]; minor leaf and twig diseases due to *M. scandens*, *M. byssicola*, *C. koleroga*, *Cephaleuros parasiticus* and *C. minimus*; and mould damage produced on the beans in fermenting and transit [ibid., xiv, p. 14].

BOURIQUET (G.). **La culture du Blé à Madagascar et les rouilles.** [Wheat-growing in Madagascar and the rusts.]—*Agron. Colon.*, xxiii, 200, pp. 40–46; 201, pp. 77–80, 1 pl., 1934.

The author states that in Madagascar wheat is attacked, in some years with great severity, by the rusts *Puccinia triticina*, *P. graminis*, and *P. glumarum*, the relative importance of which in the island has not yet been determined. Control measures are briefly considered, among which improved cultural methods appear to be the most promising.

KLEMM (M). **Schwarzrostauftreten in Deutschland und Südosteuropa im Jahre 1932.** [The occurrence of black rust in Germany and south-east Europe in the year 1932.]—*Landw. Jahrb.*, lxxx, 2, pp. 333–351, 2 graphs, 2 maps, 1934.

This is an expanded and tabulated account of the black rust of wheat [*Puccinia graminis*] epidemics in south-eastern Europe and Germany in 1932, the essential features of which have already been noticed from other sources [*R.A.M.*, xiii, pp. 152, 501]. In East Prussia and Silesia the reduction of yield from the disease is stated to have represented a financial loss of M. 38,000,000. The heaviest damage occurred on late maturing varieties and in stands receiving copious applications of nitrogen.

LEHMANN (E.), BADER (A.), MITTMANN (GERTRUD), & SCHNITZLER (O.). **Berberitzenverbreitung und Schwarzrostauftreten in Württemberg.** [Barberry distribution and the occurrence of black rust in Württemberg.]—*Landw. Jahrb.*, lxxx, 1, pp. 1–37, 3 figs., 1 diag., 5 maps, 1934.

During the summer of 1933, black rust [*Puccinia graminis*] was observed in every wheat, spelt, and rye field examined in Württemberg, often on each plant. Barberries clearly acted as foci of infection, especially in the Ulm district, in certain areas of which the wheat and spelt plants were literally covered with pustules near the alternate host. The further the distance from barberries, the slighter was the attack. During the hot, dry period later in the summer, secondary spread by the uredospores was limited, a fact that rendered the contrast between the barberry centres and the areas outside their influence all the more striking.

JOHNSTON (C. O.). **The effect of mildew infection on the response of Wheat-leaf tissues normally resistant to leaf rust.**—*Phytopath.*, xxiv, 9, pp. 1045–1046, 1 fig., 1934.

Warden (C.I. 4994) wheat in Kansas attacked by mildew (*Erysiphe graminis*) was found to lose its normal resistance to leaf rust (*Puccinia triticina* form 9) [*R.A.M.*, xiii, p. 431], presumably as a result of the splitting by the former of certain complex compounds, ordinarily unavailable to the latter, into simpler ones that may readily be utilized.

CHURCHWARD (J. G.). **A note on the occurrence of seedling lesions caused by cereal smuts.**—*Proc. Linn. Soc. New South Wales*, lix, 3–4, pp. 197–199, 1 pl., 1934.

When seed-grain of reputedly resistant and susceptible varieties of wheat and oats was inoculated with the spores of *Urocystis tritici*, *Tilletia tritici* [*T. caries*], and *Ustilago avenae*, well-defined, white, opaque spots developed on the coleoptile and first leaf of all the varieties, Algerian oats infected by *U. avenae* also showing very marked distortion [cf. *R.A.M.*, xiii, p. 623].

Sections through the spots showed the presence of two kinds of smut mycelium, one of which was deeply stained and associated with the vascular tissue, while the second, which was less abundant and less

stained, and apparently originated from the former, grew out towards the periphery at right angles to the axis of the coleoptile. The nuclei, which were seen only in the deeply stained mycelium, were in the dikaryophase.

The white, leprous spots, though not a criterion of resistance or susceptibility to smut, are better indicators of infection than is distortion, inasmuch as while all the plants of several varieties were spotted, by no means all showed distortion.

ANGELL (H. R.). **Flag smut of Wheat—early symptoms.**—*Journ. Australian Council Sci. & Indus. Res.*, vii, 3, pp. 153–156, 1934.

As already reported [*R.A.M.*, xiii, p. 623] experiments conducted at Canberra showed that when wheat seed inoculated with flag smut [*Urocystis tritici*] was sown at depths not greater than 1½ in. and germinated in darkness at about 20° C. most of the infected seedlings were distinguishable from the healthy ones by pronounced distortion. In the cold season, when under greenhouse conditions the coleoptiles remained alive for about two weeks, the infected plants were clearly distinguishable by the presence of leprous spots [see preceding abstract].

Judged by the coleoptile symptoms all the wheat varieties tested were about equally susceptible, but as the usual foliar symptoms may not appear on all the infected plants a variety may be regarded as resistant if on a majority of individual plants spores are not produced.

Seed-borne infection was experimentally controlled (in clean soil) by dusting with tillantin R [ibid., x, p. 371].

OORT (A. J. P.). **Een nieuwe methode ter bestrijding van Tarwestuifbrand (Ustilago tritici).** [A new method of combating loose smut of Wheat (*Ustilago tritici*).]—*Tijdschr. over Plantenziekten*, xl, 9, pp. 185–197, 1 graph, 1934. [English summary.]

Full details are given of experiments to determine the minimum quantity of water necessary for the disinfection against *Ustilago tritici* of Juliana wheat seed-grain moistened in water-tight containers revolving in a water bath at constant temperature [*R.A.M.*, xiii, p. 750]. The effects of 10, 15, and 20 l. of fluid per 100 kg. of seed-grain were tested at 40°, 45°, and 50° C. It was found that at 45° complete freedom from smut was obtained by five to six hours' treatment with 20 l. of water, while at 50°, using the same quantity of liquid, identical results were secured in one hour; with only 10 l. of water three to four hours are requisite for absolute control at 50°. The addition of 3 or 5 per cent. denatured alcohol, as recommended by Gassner [loc. cit.], considerably accelerated disinfection at 40° and 45° but not appreciably at 50°; furthermore, the germination of the seed-grain when alcohol was used was progressively impaired with an increase in the alcohol content and the amount of fluid used, and with a rising temperature, so that this addition is inadvisable.

BRACKEN (A. F.). **Effect of various smut treatments on yield of winter Wheat.**—*Journ. Amer. Soc. Agron.*, xxvi, 9, pp. 748–751, 1934.

In a ten-year test to determine the effect of various seed treatments against smut [*Tilletia caries* and *T. foetens*] on the yield of winter wheat

in Utah, it was found that the average outputs per acre were as follows: untreated 24·7 bushels, copper carbonate 24·8, copper sulphate 23·4, and formalin 21·8. In most cases autumn sowing was associated with a reduction of yield for the liquid treatments. The injury caused by copper sulphate was uniform on all plots, whereas formalin was responsible for irregular patches in the stand.

HERMANN (S.) & NEIGER (R.). **Untersuchungen über die fungizide Wirkung von Salicylsäure und Salicylsäureverbindungen auf Tilletia tritici.** [Investigations on the fungicidal action of salicylic acid and salicylic acid compounds on *Tilletia tritici.*]—*Zentralbl. für Bakt.*, Ab. 2, xc, 9–13, pp. 258–267, 1934.

A tabulated account is given of the results of the writers' laboratory experiments [the technique of which is indicated] at Prague, Czecho-Slovakia, on the action of salicylic acid and some of its compounds on the spores of wheat bunt (*Tilletia tritici*) [*T. caries*].

Free salicylic acid was fungicidal at a concentration as low as 0·05 per cent., but sodium or calcium salicylate only at 4 or 6 per cent. (30 minutes' immersion). None of the other alkali or alkali earth salicylates tested exercised any fungicidal action within the same period. Evidently, therefore, the anion and the duration of treatment are the determining factors in the fungicidal efficacy of the salicylates. The spores of *T. caries* are completely inactivated by the water-soluble heavy metal salicylates (copper, iron, zinc, cadmium, and lead) at concentrations up to 0·5 per cent., but the effect is temporary and readily removed by washing out the disinfectant with n/10 sodium lye followed by n/10 hydrochloric acid and then water. Suspensions of lead, basic copper, or mercuric oxide salicylates (a mixture of 0·01 to 0·1 gm. of the fungicide and 0·1 gm. of spores shaken up together for 30 minutes and then filtered) proved definitely fungicidal as indicated by subsequent germination tests on the washed spores in a 0·25 per cent. calcium nitrate solution. But the filtrates of 0·5 per cent. lead or mercuric oxide salicylate suspensions had a purely temporary fungicidal effect, which was removed by washing out the fungicide.

Laboratory and field germination tests were undertaken with bunt-infected wheat seed-grain treated with 'hajkol' dust (Chem. Fabrik B. Hájek G.m.b.H., Prag-Premyslení), the active component of which is basic copper salicylate. When the preparation was used at a strength of 0·08 per cent. only isolated spores germinated on damp soil in the laboratory, while at 0·1 per cent. no germination occurred. A completely healthy stand developed in the field from inoculated seed-grain treated with 0·1 to 1 per cent. hajkol, the general vigour of the plants pointing to a stimulatory effect of the disinfectant.

MITRA (M.). **A leaf spot disease of Wheat caused by Helminthosporium tritici-repentis Died.**—*Indian Journ. Agric. Sci.*, iv, 4, pp. 692–700, 3 figs., 1934.

This is a brief account of the author's studies of the species of *Helminthosporium* which was stated in a previous report to be very prevalent on wheat in Pusa [*R.A.M.*, x, p. 437] and which has since been identified as a strain of *H. tritici-repentis*, the common host of which is *Agropyron*

repens [ibid., xi, p. 695]. On wheat the fungus usually occurs in association with *H. sativum*, from which it cannot be easily distinguished by external symptoms, and in some years considerable damage is done by it to the crop. Its parasitism on wheat was established by a number of inoculation experiments, while further experiments showed that the fungus from wheat could infect *A. repens* and produce symptoms on this host similar to those described by Drechsler [ibid., iii, p. 65].

Conidiophores and conidia were not formed in cultures on synthetic media but developed on sterilized straw, on which sclerotia were also produced. The latter are furnished with setae and in a few cases developed into perithecia with asci and ascospores of the *Pyrenophora* type.

LAUMONT (P.) & MURAT (M.). **Observations sur la moucheture et la mauvaise germination de quelques Blés en 1933.** [Observations on 'moucheture' and the poor germination of certain Wheats in 1933.] —*Bull. Soc. Hist. Nat. Afrique du Nord*, xxv, 7, pp. 253–265, 1 pl., 1934.

The experiments briefly described in this paper were made to determine whether a correlation existed between the fairly high percentage of 'moucheture' [*R.A.M.*, xii, p. 160; xiii, p. 22] in the seed-grain of certain wheats sown in 1933 and their poor germination in the region of Maison-Carrée [Algeria]. When germinated in the laboratory, superficially disinfected grains of local and imported wheats, whether outwardly clean or exhibiting 'moucheture', all yielded the same fungi in culture, namely, species of *Alternaria*, *Cladosporium*, and *Macrosporium*, and occasionally some perithecia of *Pleospora*, the *Alternaria* sp. being present in over 90 per cent. of the grain, whether 'moucheté' or not. This would indicate, in the authors' opinion, that the *Alternaria* is not the direct cause of 'moucheture'. In all the grains tested, however, a high mortality was observed to be due to bacterial rots which have not been identified, as well as to intensely black rots of the plumule or of the radicle, or of both organs simultaneously.

Microscopical examination of clean and affected grains belonging to a number of wheat varieties of different origins showed the almost constant presence in their external integuments of a mycelium which in culture usually produced a species of *Alternaria*, believed to be *A. peglionii* [ibid., xiii, p. 21], with an occasional admixture of *Cladosporium* and *Macrosporium*, considered to be due to accidental contamination. *Helminthosporium sativum* has never been found on wheat in Algeria.

Field observations and some laboratory work would tend to confirm L. Ducellier's suggestion (*Bull. Soc. Agron. Alg.*, 1929) that 'moucheture' in Algeria is due to the activity of a species of *Thrips* which, besides causing direct injury to the crop, infects the developing grains with various parasitic fungi and bacteria which may cause a rotting of the germinating seeds. It was also noticed that a proportion of the 1933 wheat seed-grain was either broken or slightly split in the region of the embryo, where it exhibited a livid, lead-coloured discoloration. Such seed never germinated, and was shown to be invaded by *Aspergillus repens* [*R.A.M.*, xii, pp. 149, 535], the perfect stage of which (*Eurotium*

repens) was occasionally found in the ventral groove of the grains or on the germ.

HONECKER (L.). **Über die Modifizierbarkeit des Befalles und das Auftreten verschiedener physiologischer Formen beim Mehltau der Gerste, Erysiphe graminis hordei Marchal.** [On the tendency to modification of infection and the occurrence of various physiologic forms in Barley mildew, *Erysiphe graminis hordei* Marchal.]—*Zeitschr. für Züchtung*, A, xix, 4, pp. 577–602, 2 figs., 1934.

Continuing his observations at Weihenstephan, Bavaria, on the relation of environmental conditions to barley mildew (*Erysiphe graminis hordei*) [*R.A.M.*, xi, p. 101; see also xiv, p. 25], the writer found that the intensity of infection, particularly of the medium types, is liable to considerable modification by external factors. Thus, the plants kept under conditions adversely affecting assimilation, e.g., either an excess or deficiency of warmth and light, showed a measurable reduction of resistance to the fungus. The mode of inheritance of resistance is also susceptible of alteration through external influence. At 15° to 25° C. in diffuse light resistance is inherited as a recessive character, whereas at 25° to 35° in strong, direct light great susceptibility is recessive and moderate resistance dominant. These facts are considered to demonstrate the need for uniform laboratory conditions in studies on physiologic specialization and inheritance, the results of which are not necessarily applicable in all particulars to field plants.

Two physiologic forms of *E. graminis hordei* have been found to occur in south Germany, namely, A, with a very limited host range among the barley varieties tested, and B, with a wider one including all the varieties affected by A. Recent investigations have shown that form A is widespread throughout Germany, whereas the ratio of B to A is constantly decreasing except in localities where varieties resistant to A and susceptible only to B are cultivated. It is desirable, therefore, in analytical studies of biotypes, not only of *E. graminis* but of fungi in general, to cultivate some more or less resistant varieties from outside sources in addition to the local commercial sorts in order to promote the possible development of new or hitherto obscure physiologic forms.

Inoculation experiments with forms A and B on a large number of barley varieties led to the establishment (on the usual basis) of a sliding scale of resistance. Three varieties are proposed as a standard for use in inoculation experiments with collections of *E. graminis* on barley from different sources, i.e., Ackermanns Isaria, representing the largest group, highly susceptible to both A and B; Weihenstephan CP 127/422, immune from A but highly susceptible to B; and Dalmatian Ragusa, immune from both forms.

Several years' observations have shown that winter barley, as the bearer of the conidial stage of *E. graminis*, is responsible for the early mildew epidemics on the summer varieties [ibid., xiii, p. 626] in south Bavaria. On winter barley in the open only form A has hitherto been detected, form B being possibly dependent for perpetuation on the perithecial stage, in which case its sporadic and uncertain occurrence is readily explicable.

MAND. **Roggen-'Auswinterung' infolge Stock-Krankheit.** [Winter injury of Rye due to 'stock' disease.]—*Deutsche Landw. Presse*, lxi, 37, p. 460, 1934.

Typhula graminum was found causing secondary infection on rye plants attacked by the stem nematode [*Anguillulina dipsaci* (Steinb.) Gerv. & v.Ben.] in Germany [cf. *R.A.M.*, x, p. 235].

KÜSSNER (W.). **Ergoclavin, ein neues spezifisches Alkaloid des Mutterkorns.** [Ergoclavin, a new specific alkaloid of ergot of Rye.]—*Arch. Pharm. u. Ber. Deutsch. Pharm. Gesellsch.*, clxxii (xliv), 3, pp. 503–504, 1934.

Full details are given of a hitherto unrecognized alkaloid isolated (by Barger's and Carr's method for ergotoxin, *Journ. Chem. Soc.*, p. 337, 1907) from Spanish, Russian, and Hungarian samples of ergot of rye [*Claviceps purpurea*: cf. *R.A.M.*, xi, p. 446], to which the name ergoclavin is given. The new substance is stated to exert the same specific action as ergotoxin.

WELLMAN (F. L.). **Infection of Zea mays and various other Gramineae by the Celery virus in Florida.**—*Phytopath.*, xxiv, pp. 1035–1037, 1 fig., 1934.

Some two-thirds of the hundreds of maize plants inoculated under greenhouse conditions in Florida with celery virus 1 [*R.A.M.*, xiv, p. 4, and below, p. 112] by means of *Aphis gossypii* from diseased *Commelina nudiflora* and celery contracted infection. Teosinte (*Euchlaena mexicana*), sorghum, wheat, and rye seedlings were also successfully infected with the same virus. In greenhouse trials there was little difference in susceptibility between the sweet, pop, flint, and dent varieties of maize. Several maize varieties were also found spontaneously affected by the celery virus in the field. Juices from diseased maize plants produced typical celery virus lesions on cucumber cotyledons and the usual systemic symptoms on cucumber and celery.

The incubation period of the celery virus disease on maize ranged from 3 to 20 days, infection being most rapid and severe at temperatures of 70° to 90° F., when 15 to 20 viruliferous aphids were placed on the seedlings three to five days after emergence from the soil. The systemic symptoms were faintly discernible eight days after inoculation, and four days later they were distinct. Striping and stunting were marked after the plants had been diseased for three or four weeks.

The celery virus causes a stripe disease of maize in Florida very similar to (but not identical with) the white stripe of the latter crop in Cuba [ibid., xi, p. 591; xii, p. 756], differing especially in the absence of severe rosette and crook-neck symptoms. On a recent visit to Cuba, the writer observed the typical celery virus 1 symptoms on celery, squash, cucumber, *C. nudiflora*, *C. communis*, pepper [*Capsicum annuum*], sweet potato, and tomato. This virus was found to be transmissible in Florida by aphids but not by *Peregrinus maidis*, the vector of Cuban white stripe. It often causes chlorotic patterns on maize similar to those produced by the sugar-cane mosaic virus on the same host [ibid., ix, pp. 300, 560, 724], while an occasional darkening of the fibrovascular

bundles in the celery virus-infected plants is suggestive of the Hawaiian maize mosaic described by Kunkel [ibid., i, p. 194]. At an advanced stage the striping of the foliage due to the celery virus is more translucent than that associated with Cuban white stripe, with distinct demarcation between the green and chlorotic areas. Leaf-splitting and crumpling of the leaf tips may be present in the former disturbance, which is further characterized by *moiré* mottling of the first systemically infected leaves and by buff-coloured and necrotic lesions on old, heavily infected foliage.

ELLIOTT (CHARLOTTE) & POOS (F. W.). **Overwintering of Aplanobacter stewarti.**—*Science*, N.S., lxxx, 2074, pp. 289–290, 1934.

Aplanobacter stewarti, the agent of bacterial wilt of maize in the United States [*R.A.M.*, xiii, p. 571], has been found in recent experiments in Virginia to overwinter in the flea-beetle, *Chaetocnema pulicaria* Melsh. Healthy maize plants in the greenhouse were successfully inoculated with the organism recovered from the surface-sterilized insects macerated in beef broth. *A. stewarti* is known to overwinter to a limited extent in infected seed, but there is no direct evidence of its perpetuation in naturally infected field soil. It is considered probable, therefore, that *C. pulicaria*, and possibly other insects, may largely assist in carrying the pathogen over the winter.

WALTER (J. M.). **The mode of entrance of Ustilago zeae into Corn.**—*Phytopath.*, xxiv, 9, pp. 1012–1020, 2 figs., 1934.

The examination of fixed and stained material of the Rustler, Pickaninny, and Golden Bantam maize varieties inoculated in Minnesota with single and combined monosporidial lines and spore suspensions of *Ustilago zeae* showed that the fungus enters the host by direct penetration through the epidermis of young cells. The smut spores as well as the sporidia may emit germ-tubes capable of direct entry into the host. Attention has been drawn by previous workers to the occurrence of necrotic symptoms [*R.A.M.*, viii, p. 563] in maize smut, this type of response to inoculation being very probably a manifestation of hypersensitiveness and possibly correlated with a high degree of host resistance to the disease. It is mentioned that the estimated annual loss from maize smut in the United States amounts to 2 per cent. of the crop or about 55,000,000 bushels.

RANDS (R. D.) & DOPP (E.). **Variability in Pythium arrhenomanes in relation to root rot of Sugarcane and Corn.**—*Journ. Agric. Res.*, xlix, 3, pp. 189–221, 3 figs., 9 graphs, 1934.

Considerable details are given of laboratory and greenhouse experiments, in which the authors studied the variability of *Pythium arrhenomanes* [*R.A.M.*, xiii, p. 117], considered to be probably the most important of the fungi associated with root rot of sugar-cane in the United States [ibid., ix, p. 809]. Besides isolations from Louisiana and Florida, the material investigated (comprising 70 isolates) included a strain of Carpenter's from sugar-cane in Hawaii [ibid., xiii, p. 471], another from

the same host in Mauritius, various strains from maize root rot in the North-Central American States, the cereal root browning strain from Canada [ibid., xi, p. 434], and nine of the forms of *Nematosporangium* recently described by Sideris, namely, *N. arrhenomanes* and the eight new 'species' recorded by him in 1931 [ibid., xi, p. 129]. The results of oogonial measurements, cultural studies, and infection experiments [which are tabulated] showed that the strains differed widely in the size of the oogonia, the number of antheridia (often 4 to 10), rate of growth in culture, response to variations in temperature and hydrogen-ion concentration of the medium, and in virulence on the different local varieties of sugar-cane and maize. However, enough intermediate or overlapping forms were seen to indicate the inadvisability, for the present at least, of subdividing the species, especially because of certain constant and distinctive characteristics of the sexual organs such as the typical crook-necked antheridium and the remote connexion between male and female organs. For these reasons Sideris's nine forms of *Nematosporangium*, mainly from pineapple in Hawaii, are all referred to *P. arrhenomanes*. It is suggested that the diversity of forms observed may be due to hybridization between various strains, which would be particularly favoured by the diclinous relationship of antheridia and oogonia.

Physiologic specialization in *P. arrhenomanes* was indicated by the fact that the strains isolated from sugar-cane exhibited greater tolerance to high temperatures than the American strains from maize, and particularly by the wide differences in virulence between representatives of each group to both hosts. The results of preliminary field observations and infection studies now in progress in Louisiana would indicate an increase in population of the more virulent strains on sugar-cane, at least in so far as this concerns the Louisiana Purple variety, since the replacement of this variety and D–74 by more productive types.

It is evident that in breeding sugar-cane varieties resistant to the fungus, special attention should be given to differences in virulence and geographic distribution of strains of the latter. Possible specialization and multiplication of destructive physiologic strains of *P. arrhenomanes* should be retarded by the use of apparently resistant varieties, which should be successively rotated, as far as practicable, on the different fields of a plantation.

Myers (H. E.). **Effect of chemical soil treatments on the root, crown, and shoot rot of Milo.**—*Journ. Amer. Soc. Agron.*, xxvi, 9, pp. 737–739, 1 fig., 1934.

In an attempt to combat the root, crown, and shoot rot of dwarf yellow milo sorghums [*R.A.M.*, xi, p. 507] in Kansas by various soil treatments, encouraging though not fully satisfactory results were obtained by the application of ammonium nitrate at the rate of 200 lb. per acre and of sodium nitrate and ammonium sulphate (300 lb. each). That the disturbance is not directly due to the alkalinity of the soil was shown by the failure of the plants to respond to sulphur and sulphuric acid fertilizers. The micro-organism which is evidently associated with the rot appears to exert some influence on the nitrogen nutrition of the crop.

Citrus Experiment Station.—*Ann. Rept. Florida Agric. Exper. Stat. for the fiscal year ending June 30, 1933*, pp. 137–151, [1934].

G. D. Ruehle and W. A. Kuntz state that further studies on citrus melanose [*Diaporthe citri*: *R.A.M.*, xii, p. 495] indicated that, in addition to the second species of *Diaporthe* already reported [loc cit.], there is a third species of the same genus, found on decaying citrus wood in Florida, and sometimes associated with the production of stem-end rot. It has larger asci and ascospores than *D. citri* and in culture on certain media grows less rapidly. Inoculation tests demonstrated that it produces typical melanose lesions on grapefruit leaves and stem-end rot on orange fruits. In spraying tests on grapefruit and oranges Bordeaux mixture was the only fungicide which consistently gave even partial commercial control of melanose [ibid., xiii, p. 763].

Putterill (V. A.) & Davies (R.). **Citrus wastage investigations carried out at Zebediela, Transvaal, during the seasons 1931 and 1932.**—*S. Africa Dept. of Agric. Bull.* 128, 49 pp., 1934.

A comprehensive account is given of packing tests carried out in 1931–2 at Zebediela, Transvaal, to test the bearing of various pre-storage factors on the keeping qualities of Navel oranges during transit to Cape Town and to England [cf. *R.A.M.*, xiii, pp. 504, 763]. The results [which are discussed and tabulated] indicated that wastage due to green mould [*Penicillium digitatum*] decreased as the season advanced. In both years the wastage in the fruit picked and packed under the supervision of officers of the Department of Agriculture was reduced approximately to half of that which developed in fruit handled by the staff at the Zebediela Estates packing house, presumably owing to the better methods of handling employed by the Departmental officers. Packing the fruit on the day of picking tended to keep it in better condition than packing after wilting for ten days. The tests also confirmed the advantage for controlling green mould of washing the oranges before packing in a 3 per cent. sodium bicarbonate solution. No appreciable improvement in the condition of the shipped fruit was noticed from the modifications that have been made in the railway trucks. The lugboxes, into which the fruit is picked for transport to the packing house, should be disinfected before use, and experiments showed that mould was diminished by using a layer of woodwool on the bottom of the boxes to prevent injury from abrasion during the early part of the season. Control of insects such as fruit fly, which lead to the development of mould infection in the grove, is considered to be essential in eliminating waste caused by mould fungi.

Massey (R. E.). **Angular leaf spot and blackarm of Cotton caused by B. malvacearum E.F.S.**—*Rept. Second Conf. Cotton Growing Problems, 1934*, pp. 175–178, London, Empire Cotton Growing Corporation, 1934.

In this account of cotton angular leaf spot and blackarm (*Bacterium malvacearum*) in the Sudan the author gives notes on the causal organism, absence of alternate hosts locally, sources of infection, transmission, incubation period, conditions necessary for infection, and control. Most

of the experimental results mentioned have been noticed previously [cf. *R.A.M.*, xiii, p. 765].

HANSFORD (C. G.). **Blackarm disease in Uganda.**—*Rept. Second Conf. Cotton Growing Problems, 1934*, pp. 178–185, London, Empire Cotton Growing Corporation, 1934.

In this account of cotton blackarm [*Bacterium malvacearum*: see preceding abstract] in Uganda [see above, p. 82] notes are given on the prevalence and geographical distribution of the disease locally since 1922, the origin of the stem lesions, spread, the pathology of stem and branch infections, effect of the disease on the crop, seasonal carry-over, and varietal resistance.

The paper was followed by a discussion (pp. 186–195) including an account by H. R. Hosking on the progress made in Uganda in the selection of resistant varieties.

PEARSON (E. O.). **Investigations on Cotton stainers and internal boll disease.**—*Rept. Second Conf. Cotton Growing Problems, 1934*, pp. 146–155, London, Empire Cotton Growing Corporation, 1934.

Investigations conducted in the Transvaal into the part played by insects in cotton internal boll disease indicated that early in the season, when conditions are more humid than later on, staining is largely due to bacteria which are present on the surface of the boll, and subsequently enter the latter through insect punctures. Later on staining is chiefly due to *Nematospora gossypii* and *N. coryli* [*R.A.M.*, xiii, p. 368]; both were isolated from affected bolls, the former more frequently than the latter. By caging adult stainers (*Dysdercus* spp.) collected in the field, on sterile bolls it was shown that *D. nigrofasciatus*, *D. intermedius*, and *D. fasciatus* were all able to transmit *N. gossypii*. Adults of *D. nigrofasciatus* collected from wild cotton and *Hibiscus vitifolius* in November and December and from *H.* sp. in January were all found to carry *N. gossypii*, whence it appears that migrants to the crop are already infected with *Nematospora*.

Inoculations of sterile bolls hypodermically with spore suspensions of *Nematospora* demonstrated that infection spreads more rapidly in bolls which have ceased rapid growth and in which the lint is thickening than in young, rapidly growing bolls or older ones beginning to dry out. Staining is due to the coagulation and post-mortem discoloration of the protoplasmic contents of the lumen of the lint hair. This explains why in older bolls, where vacuolation of the lint hair has occurred, there is less staining than in younger ones.

During early infection by *N. coryli*, when the fungus is present as short hyphal lengths and immature sporangia, the staining is more or less confined to the part occupied by the fungus, whereas with *N. gossypii* the effect of the fungus extends far beyond the region where it is found (the immediate neighbourhood of a puncture), and there is extensive breakdown and matting of the lint, which is eventually reduced to a papery membrane closely adpressed to the seed surfaces and forming a kidney-shaped loculus.

The extension of the staining beyond the region occupied by the fungus suggests that the death of the lint hairs is due to a toxin liberated

by *Nematospora*. Bolls inoculated with sterilized, centrifuged suspensions of pure cultures of each species developed staining indistinguishable from that produced by the living organism. This was very much more marked with the toxic solution prepared from *N. gossypii* than with that from *N. coryli*.

Anson (R. R.). **Leaf curl disease of Cotton in the Fiji Islands.**—*Rept. Second Conf. Cotton Growing Problems, 1934*, pp. 195–196, London, Empire Cotton Growing Corporation, 1934.

In 1931–2 and again in 1933 a few plants at the Cotton Experiment Station, Fiji, developed a disease, not previously noted in the island, characterized by leaf curling. A short account is given of the condition. In the discussion on this paper (pp. 196–198) it was suggested that judging from the symptoms the disease did not appear to be the same as leaf roll in Nigeria [*R.A.M.*, vi, p. 162] or the virus leaf curl found in the Sudan [ibid., xiii, p. 697].

Marchionatto (J. B.). **Algunos hongos entomógenos comunes en la República Argentina y las posibilidades de su aplicación agrícola.** [Some entomogenous fungi common in the Argentine Republic and the possibilities of their agricultural application.]—*Rev. Fac. Agron. y Vet.*, Buenos Aires, vii, 3, pp. 571–584, 8 figs., 1934.

Geographical, morphological, cultural, and taxonomic notes are given on the following fungi parasitic on insects in the Argentine Republic and on their potentialities as instruments of control in the field: *Sporotrichum globuliferum* and *S. paranense* on *Schistocerca paranensis* [*R.A.M.*, xiii, p. 766, and next abstract], *Dirphia lauta*, *Oeceticus geyeri*, and *Phesia nu* (in inoculation tests also on *Colias lesbia*); *Cephalosporium lecanii* [ibid., ix, p. 33] on *Mesolecanium deltae*, *Lecanium persicae*, and *Saissetia oleae*; *Podonectria coccicola* [ibid., vi, pp. 145, 419] on *Lepidosaphes beckii*; *Peziotrichum saccardinum* Rangel on *Aspidiotus perniciosus*; *Myriangium duriaei* on *A. perniciosus* and *Chrysomphalus aurantii*; and *Sphaerostilbe coccophila* [ibid., xiii, p. 698] on *C. aurantii*.

P. saccardinum forms a dense, black mycelium on *A. perniciosus*, the insects becoming completely encrusted by the solid weft, which may extend all round the branches of the host (pear). The conidiophores formed on the mycelial stratum are dark-coloured, irregularly cylindrical, simple or sparsely branched, and denticulate at the apex on which are borne globose, smooth, hyaline (later smoky) conidia, 9 to 11 μ in diameter.

Directions (based on information supplied by E. W. Berger of the Florida Plant Board regarding the natural control of insects by *Aschersonia aleyrodis* and *A. flavocitrina* [loc. cit.]) are given for the use of the fungi under discussion against insect pests of fruit trees in the orchard.

McMartin (A.). **The locust fungus. Its artificial cultivation.**—*South African Sugar Journ.*, xviii, 9, pp. 521, 523, 1934.

After repeated attempts to cultivate the locust [*Nomadacris septemfasciata*] fungus (*Empusa grylli*) from newly dead insects [*R.A.M.*, xiii, p. 699], cultures were eventually obtained on a liquid medium consisting of maltose, glycerine, and peptone. A genetic connexion was traced

between the yeast-like bodies representing the early stages of infection in the locusts [cf. ibid., vi, p. 481] and the conidial stage. As the fungus is not an obligate parasite there is a possibility that it may persist on dead organic material or on the leaves to which masses of conidia adhere after the dead locust falls off.

Brief notes are given on three other fungi parasitic on locusts in South Africa, viz., a green *Sporotrichum* in all probability identical with the Argentinian *S. paranense* [see preceding abstract], *S. globuliferum*, and *Fusarium acridiorum* [*R.A.M.*, xiii, p. 439].

DRECHSLER (C.). **Pedilospora dactylopaga n.sp., a fungus capturing and consuming testaceous rhizopods.**—*Journ. Washington Acad. Sci.*, xxiv, 9, pp. 395–402, 1 fig., 1934.

Latin and English diagnoses, supplemented by a full discussion of the morphology and taxonomy of the organism, are given of *Pedilospora dactylopaga* n.sp., found capturing and consuming the testaceous rhizopods, *Difflugia globulosa* and *Trinema enchelys*, in agar plate cultures from decaying rootlets collected at Washington, D.C. Attention is drawn to the close relationship between the fungus under observation and the previously described species of *Arthrobotrys* and *Monacrosporium* parasitic on nematodes [*R.A.M.*, xiii, p. 509]. The protozoa are captured by *P. dactylopaga* with the aid of digitate or elongate-elliptical, apparently adhesive protuberances arising at intervals of 15 to 20 μ from the hyaline, septate hyphae, 1·2 to 2·2 μ in width, and also formed on detached conidia. From these a branch grows out and penetrates into the host cell. The few sparsely septate, hyaline, fairly erect conidiophores measure 75 to 125 by 2 to 3 μ (basal diameter) and bear at their apices solitary, bi- (occasionally tri-) lobate-furcate, hyaline, 4- to 10-, usually 7-septate conidia, 20 to 40 (mostly 30) μ in length, the lobes parallel to or slightly divergent from one another and generally consisting of 2 to 4 (typically 3) cells in linear arrangement.

REDAELLI (P.) & CIFERRI (R.). **Gilchristia dermatitidis (Gilchr. et Stokes) Cif. et Red., the causative agent of the American Gilchrist disease (dermatitis verrucosa).**—*Journ. Trop. Med. & Hygiene*, xxxvii, 18, pp. 280–282, 1934.

An account is given of the writers' studies on the cultural, morphological, biochemical, and pathogenic properties of *Endomyces dermatitidis* (Gilchr. & Stokes) Moore, *E. capsulatus* Rewbridge, Dodge, & Ayers and its var. *isabellinus* Moore [*R.A.M.*, xiii, pp. 95, 636] pathogenic to man in the United States, and *Blastomyces gilchristi* from Brazil.

The gross characters and biochemical properties of the four strains are very similar and all are only mildly pathogenic to laboratory animals. An outstanding common feature of the three first-named organisms is their reversible cultural dimorphism. Cultures obtained from affected tissues on glycerol agar at 37° C. are granular, whitish, friable, and subcerebroid (type I or yeast-like). At room temperature on common solid media a more or less cottony growth is formed, the granulations being mixed with echinulate, subcoremioid hyphae (II or intermediary type). At another stage the cultures are quite white and cottony, with no traces of the yeast-like forms (III or hyphomycetic type), while a further

type (IV) resembles the foregoing but is of a brownish colour. *B. gilchristi* failed to develop at 37°, so that its dimorphic possibilities could not be investigated.

In respect of the morphological characters of the fungi under observation, Moore's observations are fully substantiated by the authors who, however, do not accept the reference of the *dermatitidis-capsulatus* forms to the genus *Endomyces* from which they are considered to be markedly different. A new genus, *Gilchristia* Cif. & Red., is therefore created and furnished with a Latin diagnosis. The following is the synonymy of the type species, *G. dermatitidis* (Gilchr. & Stokes) Cif. & Red. nov. comb.: *B. dermatitidis*, *Oidium dermatitidis*, (?) *Cryptococcus gilchristi*, *Zymonema dermatitidis*, *Mycoderma gilchristi*, *C. dermatitidis*, *E. capsulatus*, *Monilia capsulata* Vuillemin 1931, *E. dermatitidis*, *E. capsulatus* var. *isabellinus*, and *B. gilchristi* (non *Blastomycoides dermatitidis* Cast. 1927, nec. *Geotrichum dermatitidis* Cast. 1933).

Benham (Rhoda W.). **The fungi of blastomycosis and coccidioidal granuloma.**—*Arch. of Dermatol.*, xxx, 3, pp. 385–400, 13 figs., 1934.

Three important types of mycotic infection, each associated with a different fungus, are described, namely, cryptococcosis (*Cryptococcus hominis*) [*R.A.M.*, viii, p. 574], American blastomycosis or Gilchrist's disease (*Blastomyces dermatitidis*) [*Gilchristia dermatitidis*: see preceding abstract], and coccidioidal granuloma (*Coccidioides immitis*) [ibid., xiii, p. 635]. In addition to these three organisms there are at least seven others capable of causing systemic infections with granulomatous lesions appearing in the diseased tissue as rounded, yeast-like cells, namely *Histoplasma capsulatum* [*Posadasia capsulata*: ibid., xiii, p. 768], *Cryptococcus farcinimosus* [ibid., xii, p. 172], *Phialophora verrucosa* [ibid., xii, p. 370], *Hormodendrum* [*Trichosporium* or *Acrotheca*] *pedrosoi* [ibid., xiii, p. 234], *Rhinosporidium seeberi* [loc. cit.], *Sporotrichum schenckii* [ibid., xii, p. 569], and *Monilia* [*Candida*] *albicans*. *Torula histolytica* [ibid., xiii, p. 236] appears to be identical with *Cryptococcus hominis*; *Glenospora gammeli* [ibid., xiii, p. 637], *Monosporium tulanense* [ibid., xiii, p. 235], *Endomyces capsulatus* and its var. *isabellinus*, and *E. dermatitidis* [see preceding abstract] with *B. dermatitidis*; and *Scopulariopsis americana* [ibid., xiii, p. 235] with *Coccidioides immitis*.

Stowe (W. P.). **A simple technic for finding Coccidioides immitis.**—*Journ. Lab. & Clin. Med.*, xix, 9, p. 1013, 1 fig., 1934.

The characteristic spherical bodies of *Coccidioides immitis* [see preceding and next abstracts] have recently been found to show a strong iodine-staining capacity, taking a rich brown tint in five minutes with Lugol's or Gram's iodine solution at a concentration sufficient to colour the other cells in sputum or pus lemon-yellow.

Redaelli (P.) & Ciferri (R.). **Études sur le 'Coccidioides immitis' Stiles. II. Présence du granulome coccidioide en Europe.** [Studies on *Coccidioides immitis* Stiles. II. Presence of coccidioidal granuloma in Europe.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 7–8, pp. 255–257, 1934.

After stating that up to June, 1931, only two cases of human infection

by *Coccidioides immitis* [see preceding abstract] had been reported from Europe, both in Naples, causing a mild form of pulmonary mycosis, the authors refer to a third case, also in Naples, in which the disease was contracted after an injection with a hypodermic syringe, the needle of which was presumably infected. The fungus was isolated by Castellani who regarded it as a new species *Glenospora meteuropaea* [*R.A.M.*, xiii, p. 162], but from a study of its cultural, biochemical, and biological characters the authors definitely consider it a strain of *C. immitis*, which they name *C. immitis* var. *meteuropaea*.

Attention is drawn to the fact that the three first truly autochthonous cases of the European form of the disease have all been observed in Naples and that in all three the disease, in striking contrast to what occurs in America, was present in a comparatively mild form.

Emmons (C. W.). **Dermatophytes: natural grouping based on the form of the spores and accessory organs.**—*Arch. of Dermatol.*, xxx, 3, pp. 337–362, 27 figs., 1934.

Considering the present systems of classification of the dermatophytes unsatisfactory, the writer has conducted morphological studies on plate and tube cultures, supplemented by a modified form of Henrici's culture cell method [*R.A.M.*, x, p. 257], the results of which have indicated certain natural lines of separation in the group.

The spores ordinarily termed aleuria and 'fuseaux' (spindles) are considered to be conidia and macroconidia. The subterminal elements of the branching conidiophore-like structure are regarded as actually spores, so that the latter are formed in short chains. The interspecific and intergeneric relationsips between the ringworm fungi may be determined by the form of the conidia. Three types of macroconidia are differentiated, viz., those of *Trichophyton*, clavate, thin-walled, with few septa; *Epidermophyton*, clavate to oval, thick-walled, few septa; and *Microsporon*, spindle-shaped, thick-walled, with up to 15 septa. These are the three natural groups of dermatophytes, and their generic names *Trichophyton* and *Microsporon* are retained on grounds of priority and *Epidermophyton* (*sensu* Sabouraud) on account of established usage. The genera *Achorion* and *Endodermophyton* are regarded as superfluous, their species falling within the limits of the three foregoing and their retention being a fertile source of confusion.

Chlamydospores and spirals have been found to possess little taxonomic value. Many species form 'nodular organs', which are probably ascogonia. In a series of attempted matings, the number of 'ascogonia' was increased at the line of junction between certain pairs, notably those involving *T. mentagrophytes*, but conclusive evidence of heterothallism was not obtained [ibid., xiii, p. 768].

In a general way, the mycological classification here proposed follows Sabouraud's clinical grouping. A partial list of the synonymy of the dermatophytes is given, based for the most part on the lines suggested by Langeron and Milochevitch, Ota and Kawatsuré, and others [ibid., xii, p. 694; xiii, p. 302, *et passim*]. The limits of *T. mentagrophytes* are further extended to include the *T. niveum* group [ibid., xii, p. 695]. Further work on this phase of the problem is in progress.

Aldick (W.). **Über eine Mikrosporieepidemie in Schleswig-Holstein und ihre Behandlung mit Zimtchloroform.** [On a *Microsporon* epidemic in Schleswig-Holstein and its treatment with cinnamon chloroform.] —*Arch. für Dermatol.*, clxx, 4, pp. 473–484, 6 figs., 1934.

In an epidemic of microsporiosis involving 301 children in Schleswig-Holstein, 29 of the 41 cultures of *Microsporon audouini* [*R.A.M.*, xiii, pp. 577, 637] examined on Grütz's agar developed a mutant form characterized by a slow formation of cerebriform colonies with slender peripheral extensions. Intercalary and terminal chlamydospores were present in abundance, but there was no aerial mycelium. On transference to maltose and glucose the variant (apparently a rudimentary form of the species) developed the typical characters of *M. audouini*. The mutation, however, cannot be ascribed to the influence of the medium since the latter also yielded typical cultures in 12 cases. The clinical and therapeutical aspects of the epidemic are discussed.

De Gregorio (E.). **Trichophytie cutanée par vaccination antivariolique.** [Cutaneous trichophytosis induced by anti-smallpox vaccination.]—*Ann. de Dermatol.*, Sér. 7, v, 9, pp. 854–863, 6 figs., 1934.

An account is given of an epidemic of cutaneous trichophytosis following vaccination, 23 cases of which were studied by the writer at Saragossa, Spain. The disorder assumed three well-differentiated clinical forms [which are briefly described] but the same causal organism was found to be responsible in all cases, viz., *Trichophyton faviforme discoides* [cf. *R.A.M.*, viii, p. 309; ix, p. 244; xiii, p. 701]. Numerous interlaced, unevenly septate hyphae and spherical spores occurred in the squamae and also developed in the fur of inoculated guinea-pigs. Infection must have originated in the cattle furnishing the inoculum, and evidently the organism was still in a viable state in the fresh material applied to the patients.

Baeza (M.). **Note statistique préliminaire sur les teignes du Maroc espagnol.** [Preliminary statistical note on the ringworms in Spanish Morocco.]—*Ann. de Parasitol. Humaine et Comp.*, xii, 5, pp. 405–407, 1934.

The preliminary results of the author's special investigation in the Spanish Protectorate of Morocco showed the preponderance among the older children of favus, the varying symptoms of which would suggest that the disease is either caused by other fungi than *Achorion schoenleini* [*R.A.M.*, xii, p. 510], or that there exist locally several different species of human *Achorion*. Younger children were chiefly affected with trichophytosis, almost exclusively caused by *Trichophyton violaceum*, with only a few cases due to *T. sulphureum* either alone or in association with the former.

Milochevitch (S.). **Diagnostic microscopique des teignes de la peau glabre.** [Microscopical diagnosis of ringworms on the glabrous skin.]—*Ann. de Parasitol. Humaine et Comp.*, xii, 5, pp. 408–417, 2 pl., 1934.

The author states, in agreement with some other investigators, that an accurate determination of the specific cause of ringworms developing

on the human glabrous skin cannot be made by the examination of the elements of the organism contained in the squamae from the lesions, nor from their aspect either on or in the downy hairs (lanugo) which are commonly present on such skin. As indicated, however, by a number of clinical cases [details of which are given], a definite diagnosis can be arrived at by studying the development of the fungus in the coarser hairs which also occur sparsely on the glabrous skin. His recent work has allowed him to distinguish four types of glabrous skin ringworms by this means, namely, endothrix, megaspore, microid, and *Microsporon*, and in every case he obtained in culture the corresponding organism as diagnosed in advance.

TAKAHASHI (S.). **Über eine neue Art von tierischem Microsporon.** [On a new species of animal *Microsporon.*]—*Japanese Journ. of Dermatol.*, xxxvi, 3, pp. 261–266, 7 figs., 1934. [Japanese, with German summary on pp. 55–56.]

Microsporon sapporoense n.sp. is the name given to a fungus isolated from the well-defined, maculo-vesicular lesions on the chest and upper arm of a young Korean labourer. The septate hyphae occurring in the squamae were 3 to 4 μ in width and grew rapidly on Sabouraud's maltose agar, forming furcate colonies with alternating deep and pale yellow zones and a whitish periphery. Later the colour deepens from the centre outwards and within about four weeks the consistency of the colonies undergoes pleomorphic pubescent and pulverulent modifications. Satisfactory growth was also made on peptone, potato, and carrot agars, the colonies on the first-named being chocolate-coloured and on the others brownish-white. Numerous spindles, nodular organs, and chlamydospores (terminal and intercalary) developed. Positive results were given by inoculation experiments on laboratory animals.

SEEHAWER. **Mykologische Untersuchungen über die im Hoppegarten beobachtete Trichophytie der Rennpferde.** [Mycological investigations on the trichophytosis of racehorses observed in Hoppegarten.] —*Zeitschr. für Veterinärkunde*, xlvi, pp. 180–194, 1934. [Abs. in *Zentralbl. für Bakt.*, Ab. 1 (*Ref.*), cxv, 17–18, p. 410, 1934.]

Trichophyton equinum [*R.A.M.*, xiii, p. 303] was found to be the agent of an epizootic dermatomycosis of racehorses in Berlin. The fungus grew readily on Grütz's nutrient medium. Partial immunity was acquired both by horses and guinea-pigs after one or more artificial inoculations. *T. equinum* proved to be highly pathogenic to man. It is believed to have been introduced from abroad with foreign racehorses.

LEBASQUE (J.). **Recherches morphologiques et biologiques sur les Trichophyton mégaspores du cheval et du boeuf.** [Morphological and biological studies on the equine and bovine megasporous species of *Trichophyton.*]—*Ann. de Parasitol. Humaine et Comp.*, xii, 5, pp. 418–444, 2 pl., 3 figs., 1934.

This is a full morphological and cultural account of the three new species of *Trichophyton* causing equine and bovine ringworms, a brief report on which was given in a previous communication [*R.A.M.*, xiii, p. 303], namely, *T. bullosum* from the horse in Tunis, Sudan, and Syria,

T. villosum from cattle in Tonkin and Annam, and *T. papillosum* from cattle in Syria and Morocco. *T. bullosum* belongs to the megasporous endo-ectothrix group; around the attacked hairs it produces rounded spores, 5 to 8 μ in diameter, often in chains, while inside the hairs the spores are somewhat smaller (3 to 4 μ) and are disposed in a mosaic-like pattern. In the squamae the mycelium is branched and composed of cells 7 to 11 by 2·5 to 3·5 μ in diameter, interspersed with thick-walled, oblong spores measuring 8 to 10 by 4 to 5 μ. *T. villosum* also belongs to the same group; around the affected hairs it forms an incomplete sheath consisting of round, thick-walled spores, 4 to 8 μ in diameter, grouped in long, irregularly disposed chains. In the squamae threads are found, composed of elongated, very thick-walled spores, measuring 8 to 10 by 3 to 4 μ, together with long, apparently non-septate hyphae of the same width. *T. papillosum* forms, around the hairs, a continuous sheath, adhering to the Henle layer, composed of polyhedral spores, disposed in a mosaic-like pattern, and measuring 6 to 8 μ in diameter. When the Henle layer of cells is broken, the spores are round and very large (8 to 12 μ), and are disposed in chains adhering to the epidermicule. Among the debris of the epidermis are found mycelial threads, 5 to 6 μ in width, with septa at intervals of 7 to 8 μ.

The remainder of the paper is given to a discussion of the affinities of the faviform megasporous species of *Trichophyton* parasitizing the horse and cattle, most of which has already been noticed [loc. cit.]. In addition, it is stated that experiments have shown that the aleuria of *T. album*, which are produced when the fungus is grown on barley or wheat grains or on horse droppings, are highly infective, a fact which would suggest that the animal dermatophytes are able to live as saprophytes in damp and poorly aerated stables, this offering a ready explanation of the outbreaks of ringworm in cattle kept over winter indoors, without any apparent infection from outside.

WEISZ (E.). **Die Pilzflora des menschlichen Fusses.** [The fungous flora of the human foot.]—*Arch. für Dermatol.*, clxx, 4, pp. 485–486, 1934.

Kaufmann-Wolf's *Epidermophyton* [*R.A.M.*, xiii, p. 237] and *Scopulariopsis brevicaulis* [*Penicillium brevicaule*: ibid., xiii, p. 512] were responsible for 25 and 13 per cent., respectively, of the cases of foot mycosis investigated by the writer at Budapest, the remainder being due to yeasts, *Epidermophyton*, *Trichophyton*, and *Achorion* spp. Both on diseased and normal feet the incidence of fungi was higher and more variable than in other parts of the body.

GLINGANI (A.). **Isolamento di un raro micete (Corethropsis hominis) da dermatosi interdigitale.** [Isolation of a rare fungus (*Corethropsis hominis*) from a case of interdigital dermatitis.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, v, pp. 5–23, 11 figs., 1934. [Latin and English summaries.]

From a case of dermatitis interdigitalis dysidrosiformis on the hand of a female patient the author isolated a fungus which in culture on various media formed yellowish-white or creamy colonies with yellowish-red shading, at first cottony and later granulose-pulverulent. Conidia

are produced in clusters formed of spherical or spheroidal spores measuring 2·5 μ in diameter and borne singly at the tips of short, crowded, branched conidiophores. The organism, which is considered to be a variant of *Corethropsis hominis* [*R.A.M.*, ix, p. 244], is named *C. hominis* Vuillemin var. *sphaeroconidica* Cif. et Bald. n. var. Inoculations of laboratory animals with pure cultures of the fungus gave negative results and its pathogenicity is regarded as very doubtful. This is stated to be the first record of the species since its original isolation [loc. cit.].

McCrea (Adelia). **Fungicidal value of some common dyes against dermatophytic fungi.**—*Mycologia*, xxvi, 5, pp. 449–453, 1934.

A tabulated account is given of the writer's experiments on the control of *Trichophyton interdigitale* [*T. mentagrophytes*] and *Epidermophyton* [*T.*] *rubrum* by five aniline dyes, viz., aniline violet, basic fuchsin, gentian violet, brilliant green, and malachite green [*R.A.M.*, x, p. 791; xiii, p. 238], *Aspergillus niger* being used for comparison. The two last-named substances proved superior to any of the others tested, especially against *T. mentagrophytes* which was killed by both at a strength of 1 in 75,000 in one minute. *T. rubrum* and *A. niger* were more resistant, a concentration of 1 in 10,000 being required to kill them in the same time. Aniline violet proved lethal to *T. mentagrophytes* in five minutes at 1 in 500 but failed to destroy the other two organisms in periods up to one hour. Neither basic fuchsin nor gentian violet gave any indication of practical utility for the purpose in view.

Woodward (G. J.), Kingery (L. B.), & Williams (R. J.). **The fungicidal power of phenol derivatives. I. Effect of introducing alkyl groups and halogens.**—*Journ. Lab. & Clin. Med.*, xix, 11, pp. 1216–1223, 1934.

Using a modification of Kingery's and Adkisson's method [*R.A.M.*, vii, p. 634], the writers tested the fungicidal activities of 37 phenol derivatives and some miscellaneous fungicides on *Monilia* [*Candida*] *tropicalis* [ibid., xiii, p. 767], *Cephalosporium* sp., and *Sporotrichum* sp.

The results of the experiments [which are tabulated and discussed] showed that the substitution of one or more alkyl (especially dialkyl) groups on the benzene ring in phenols increases fungicidal activity. Compounds containing an alkyl group with six carbon atoms arranged in a straight chain appear from the present data to have the highest phenol coefficients. The toxicity of the phenols towards the test organisms was found to be several times multiplied by the substitution of halogen atoms (iodine, bromine, and chlorine in the order named). Of the phenol derivatives under investigation, n-hexylresorcinol [ibid., xiii, pp. 164, 791] and the n-hexyl ether of resorcinol gave the best fungicidal effect on the test fungi, closely followed by chlorothymol; all three should be of practical utility in the treatment of human skin diseases. Promising results were also given by the n-butyl, n-amyl, and phenyl propyl ethers of resorcinol and 3·5-dibutyl phenol, while thymol, carvacrol, and salicylic acid are actually being used with fair success in therapeutical work.

MUNDKUR (B. B.). **A Sclerotinia rot of Hibiscus sabdariffa Linn.**—*Indian Journ. Agric. Sci.*, iv, 4, pp. 758–778, 3 pl. (1 col.), 1 graph, 1934.

A detailed account is given of the author's study of a serious stem rot of 'patwa' (*Hibiscus sabdariffa*) grown for seed at Pusa, caused by *Sclerotinia sclerotiorum*. Infection from sclerotia and mycelium only occurs in December and January through wounds in the stems, but under experimental conditions the unwounded tissues can be infected by the ascospores from November onwards, though early infection from this source does not occur in nature since the ascospores are not produced in the field before on the onset of cool weather (22° C. or lower). The optimum temperature for growth of the fungus was found to be about 22°, with a minimum apparently at 8° or below, and a maximum at 32·5°. The sclerotia were not killed by exposure to dry heat as high as 60°, but were destroyed by immersion for five minutes in water at 48° to 50° C. Sclerotia buried in soil at a depth of over one inch did not produce apothecia, indicating the advisability of deep ploughing of infected land as a means of control of the disease. Infected seed should be hand-picked to remove the sclerotia, as these bodies have been found in the seed collected from an infected plot. On sound plants infection evidently is caused chiefly by the ascospores which are believed to infect normally through the dead corolla or calyx of the flowers and to pass back into the stem through the pedicel. No evidence of natural infection from the soil or through the roots was obtained.

BONGINI (VIRGINIA). **Un nuovo fungillo della Peonia.** [A new fungus on Peony.]—*La Difesa delle Piante*, xi, 4, pp. 109–121, 9 figs., 1934.

Some years ago peonies growing in northern Italy were attacked by a disease which has not since reappeared and is thought to have been favoured by the weather conditions then prevalent. Both herbaceous and shrubby varieties were affected, but on the latter the effects were practically negligible. In herbaceous varieties brown, dry, irregular, spots with greyish concentric zones surrounded by a darker edge and a yellowish, shaded halo, developed on the leaves, usually at the tip or edges, occasionally in the middle. The centres of the lesions gradually became ash-coloured. The dead areas, which were round or slightly elliptical, at first measured only a few millimetres in diameter but spread as concentric rings bordered by grey lines until in the middle of the leaf blade they reached a diameter of 4 cm. Spots near the tip spread inwards for distances of up to 5 cm., the zonate formation being retained. The discoloured areas later split, the dead tissue crumbled away, and the leaves withered and fell. On the leaf stalks the spots measured 1 to 4 mm. in diameter, were ash-coloured at the centre and dark brown at the periphery, and were slightly elongated along the axis.

The spots bore amphigenous, globose, membranous, blackish-brown, glabrous, depressed, later erumpent pycnidia measuring 180 to 200 μ in diameter and with a very small ostiole; the hyaline, straight, slightly clavate sporophores measured 12 by 4 μ, and the elliptical, obovate or ovoidal, continuous, very occasionally 1-septate, hyaline, later olivaceous, then brown, guttulate spores were rounded at each end and averaged 20 to 25 by 10 μ.

When fresh material was grown in hanging drop cultures the young spores germinated after 36 to 38 hours at 20° or 22° C., and after about 30 hours at 26° or 28°. Normally, germination always occurred laterally at or near one end of the spore. Growth was moderately rapid, the mycelium turning chlorine-chestnut after the second day at a temperature ranging between 22° and 26°. The spore production was, however, insufficient for inoculation experiments. Spores from cultures kept in the laboratory for over two years failed to germinate.

The author considers that her fungus is a *Sphaeropsis* morphologically distinct from the species of this genus hitherto described, and names it *S. paeoniae* with a Latin diagnosis.

GREEN (D. E.). **The virus of spotted wilt in Gloxinias.**—*Gard. Chron.*, xcvi, 2488, p. 159, 1 fig., 1934.

Gloxinia [*speciosa*] plants examined at the Royal Horticultural Society's laboratory, Wisley, Surrey, in June, 1934, were found to be severely affected by the tomato spotted wilt virus [*R.A.M.*, xiii, p. 647]. This adds another new host to the list of those already known to harbour the virus in England, including [in addition to a number already mentioned in this *Review*] broad beans [*Vicia faba*] and bindweed [*Convolvulus arvensis*]. The diseased *Gloxinia* leaves showed well-defined, brown rings, sometimes contiguous, of necrotic tissue enclosing healthy green areas, and tests by Dr. K. M. Smith at Cambridge established the identity of the virus.

TILFORD (P. E.). **Stem canker disease of Gardenia.**—*Ohio Agric. Exper. Stat. Bimonthly Bull.* 168, pp. 116–117, 1 fig., 1934. [Abs. in *Exper. Stat. Record*, lxxi, 5, p. 662, 1934.]

Greenhouse *Gardenia* plants in Ohio were observed to bear rough, swollen cankers on the stem bases, causing stunting and gradual decay. Black pycnidia of the *Phomopsis* type were detected half-buried in the affected cortex, exuding yellowish masses of filiform and elliptic-fusiform spores under very moist conditions [*R.A.M.*, xiii, p. 379]. Both spore-forms occurred in the same pycnidium. The fungus appears to be a weak wound parasite, infection by which may be avoided by ordinary care in cultural operations.

HINO (I.) & HIDAKA (Z.). **Beautiful spotted Bamboos from Hiuga, Japan.**—*Botany & Zoology*, Tokyo, ii, 7, pp. 1187–1196, 12 figs., 1934. [Japanese.]

The rare and beautiful spotted bamboos ('hantiku'), which have been greatly prized in Japan from the earliest times, were formerly considered to represent a distinct botanical form (*Phyllostachys bambusae* forma *tanakae* or *P. reticulata* f. *tanakae*). The writers' studies have shown, however, that the bamboos in question are simply ordinary specimens of *P. reticulata* attacked by an Ascomycete, *Asterinella hiugensis* n.sp., and not a special variety. The fungus reported by Kawamura on spotted bamboos from Hiuga in 1930 as *Micropeltis bambusicola* [*R.A.M.*, viii, p. 468] has been transferred by the writers to *Phragmothyrium* as *P. semiarundinariae*. It produces a handsome spotted effect on the

culms of *Semiarundinaria narikirae*. In both these cases another species of *Phragmothyrium*, *P. japonicum* n.sp., was found on the lesions.

Latin diagnoses are given of the three fungi. *A. hiugensis* has dimidiate-convex perithecia, 103·5 to 402·5 μ in diameter, containing numerous filiform, hyaline paraphyses, 1 to 2 μ in breadth, and ellipsoidal, 8-spored asci, 25·7 to 47·5 by 21·8 to 31·4 μ in diameter. The ascospores are ovoid, obtuse-ended, 1-septate, constricted, ultimately brown, and 16·2 to 20·9 by 8·6 to 10·5 μ. *P. semiarundinariae* has superficial convex-scutate perithecia, 25·6 to 176·0 μ in diameter, without a hirsute margin. The asci are cylindrical, short-stalked, obtusely attenuated at the apex, 8-spored, and 41·6 to 57·6 by 9·6 to 10·9 μ in diameter; crowded filiform paraphyses, 1·5 μ in breadth are also present. The ascospores are elliptical-oblong, straight, with an obtuse apex, hyaline, usually 2-, rarely 3-septate, slightly constricted and 12·8 to 15 by 2·6 to 4·8 μ. *P. japonicum* has convex-dimidiate perithecia, 16·3 to 71·5 μ in diameter, not hirsute at the margin, with fusoid, obtusely attenuated, 8-spored asci, 45·5 to 65·5 by 6·5 to 9·8 μ, and numerous hyaline, filiform paraphyses, 75 to 110·5 by 2·5 μ. The ascospores are fusoid, hyaline, 5-septate, slightly constricted, and 16·5 to 22·5 by 1·8 to 4·5 μ in diameter.

Shapiro (Mme S. M.). Оригинальный случай мозаики у **Lappa sp.** [A curious case of mosaic in *Lappa* sp.]—ex *Вирусные долезни растений в Крыму и на Украине* [*Virus diseases of plants in the Crimea and the Ukraine*], pp. 109–113, 4 figs., Госуд. Йздат. Крым [State Publ. Office for the Crimea], Simferopol, 1934. [German summary.]

A brief morphological account is given of a disease of a species of burdock (*Lappa*) [*Arctium*] which has been observed by the author since 1925 in Kharkoff [Ukraine]. In mild cases the disease is characterized by a mosaic pattern on the leaves, strongly suggestive of a virus disease, and this is supported by the anatomical changes caused in the leaves; in cases of more severe infection, however, the leaf lamina is considerably reduced, until occasionally it may assume all the shapes described for the fern-leaf disease of tomato [*R.A.M.*, xiii, p. 809]. The disease is believed to be the first record in weeds of such malformation of the leaves, presumably due to a virus agency, and is interesting because of its possible relationship with the tomato disease.

Richter (H.). **Eine noch nicht aufgeklärte Lupinenkrankheit.** [A hitherto unexplained Lupin disease.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiv, 9, pp. 81–82, 4 figs., 1934.

Attention is drawn to an obscure disease of lupins (*Lupinus luteus*, *L. albus*, and *L. angustifolius*) which has been the subject of investigation at the Berlin Biological Institute for the last three years. The first symptoms are brown, striate discolorations of the stem, rapidly followed, especially in young plants, by crooking of the upper portion of the shoot, the tip of which is often bent downwards to form a hook.

The stem tissues become translucent and brittle, and the foliage wilts and droops. In some cases the initial stages of the disease are accompanied by a dark spotting of the base of the shoot, just above soil level, giving the impression of an incipient foot rot. In older plants the pods turn brown and shrivel, the seeds, if any, being poorly developed. Brown, necrotic foci occur in the collenchyma of the stem and extend into the cortical parenchyma. The xylem is discoloured and the wood vessels partially occluded by a homogeneous brown mass; ultimately the phloem and (just before the death of the plant) the cambium also become involved. No pathogenic organisms have been isolated from the diseased tissues, and the presence of *Fusarium* spp. in the root system of affected lupins is thought to be of purely secondary importance [cf. next abstract].

Neill (J. C.). **'Sore shin': a virus disease of blue Lupins.**—*New Zealand Journ. of Agric.*, xlix, 3, pp. 139–146, 3 figs., 1934.

During the past three years, blue field lupins [*Lupinus angustifolius*] in New Zealand have been widely attacked by a disease for which the name 'sore shin' is suggested. At Palmerston North all the plants in one plot became affected, while up to 30 per cent. infection was reported from other localities. The incidence of the disease is usually greatest where successive lupin crops are grown for green manure.

The affected plants first showed slight stunting with a characteristic curling of the growing point to one side, on which a light brown streak appeared simultaneously and gradually spread along the whole length of the stem. Growth ceased with the first symptoms. When a diseased plant was cut, the vascular system showed a brown discoloration more extensive in the roots and growing point than in the main stem. Eventually, however, the whole stem turned brown. The young leaves wilted and blackened, while the older ones became tinged with purple, turned yellow and fell. The stem became black, the roots decayed, and the plant died. Infection occurred at all stages of growth.

Isolations from diseased material yielded bacteria and a *Fusarium*, inoculations with which into healthy lupins gave negative results [see preceding abstract]. When the leaves of healthy lupins were rubbed with juice from diseased plants typical symptoms resulted in 33 out of 89 plants, all of 48 uninoculated controls remaining healthy. No sore shin developed on 115 lupins grown from seed taken from affected plants.

It is concluded that the disease belongs to the virus group, and is not seed-borne.

Peltier (G. L.). **The inability of Aplanobacter insidiosum to enter Alfalfa seedlings in the absence of wounds.**—*Phytopath.*, xxiv, 9, pp. 1044–1045, 1934.

Particulars are given of experiments under controlled greenhouse conditions at Lincoln, Nebraska, the results of which conclusively demonstrated the incapacity of *Aplanobacter insidiosum*, the agent of lucerne wilt [*R.A.M.*, xiii, p. 582], to enter the plants (Grimm) except

through wounds. It is considered safe to assume that, under ordinary field conditions, the same limitations will apply.

Shaw (L.). **Studies on resistance of Apple and other Rosaceous plants to fire blight.**—*Journ. Agric. Res.*, xlix, 4, pp. 283–313, 1 pl., 13 graphs, 1934.

A detailed account is given of greenhouse and orchard experiments at Madison, Wisconsin, the results of which [shown in graphs] indicated that the 31 species of Rosaceae (belonging to the genera *Amelanchier, Aronia, Cotoneaster, Crataegus, Malus, Pyrus*, and *Sorbus*) tested varied widely in their relative resistance to fireblight (*Erwinia amylovora*) [*Bacillus amylovorus*: *R.A.M.*, xiii, p. 707]. While apples, as a class, exhibited the least resistance, wide differences were also found in the relative susceptibility of the 25 varieties studied, the differences being of the same order both under greenhouse and orchard conditions. Of the four varieties that were tested most intensively, Northwestern Greening was consistently found to be the most and Yellow Transparent the least resistant, McIntosh and Wealthy being intermediate but somewhat variable in their reaction. Resistance was shown to increase with the age of the shoots, the increase being most rapid in Northwestern Greening and slowest in Yellow Transparent. The development of resistance appeared to be favoured by a low content of the soil in nutrients and a relatively low soil moisture, as well as by an atmospheric temperature of 28° C. during the period prior to inoculation of the shoots; 16° was the least favourable of the temperatures (16°, 20°, 24°, and 28°) tested. In Fameuse apple shoots, the development of resistance was best favoured by soil temperatures of 12° and 32°, and least by those of 20° and 24°. A positive relation was found between resistance and lowered vigour of the shoots. In Northwestern Greening and Wealthy trees, resistance to the blight was decreased by prolonged exposure to atmospheric moisture approaching saturation after inoculation, new shoots usually blighting entirely on trees subjected to high humidity for 72 and 93 hours. Resistance in the new terminal growth of the shoots was found to be directly related to low atmospheric humidity.

The work also showed that the fireblighted tissues were usually separated from the healthy by cork layers during the late stage of the development of the disease, the cork layer usually involving the entire circumference of the shoot and extending inwards through the cortex and apparently through the phloem and cambium; a well-defined cork layer was not, however, observed inside the cambium. The pathogen was commonly found in all the tissues extending towards the apex of the shoots from the cork layers, and also in the xylem and pith (but not in the cortex, phloem, or cambium) at considerable distances towards the base of the shoots. Evidence was also obtained that once the lesions are corked-off, the cork layers and the xylem commonly serve as relatively effective barriers against further invasion by the organism of the cortical, phloem, and cambial tissues. While the varieties of apple differed in the time after inoculation required for the corking-off process, in general this time was shortest in the more resistant varieties. The process was favoured by low soil moistures and delayed by high atmospheric humidity.

Wormald (H.). **The development of scab in stored Apples.**—*Journ. Min. Agric.*, xli, 6, pp. 551–556, 4 figs., 1934.

In February, 1934, the author examined Bismarck apples taken from storage and showing (*a*) saucer-shaped, slimy, jet-black depressions with fairly well defined margins, (*b*) superficial dark brown spots showing irregular margins, and (*c*) pin-head spots [*R.A.M.*, viii, p. 155]. Some of the sunken spots bore conidial fructifications of *Venturia inaequalis*. The largest individual spots were about $\frac{1}{8}$ in. in diameter, but in places the lesions coalesced into sunken, blackened areas up to $\frac{3}{4}$ in. across. A few spots of the ordinary fruit scab type were also found. Apples of other varieties stored under the same conditions remained unaffected.

In March, Bismarck apples showing the same circular, jet-black, sunken spots were received from another locality. Each spot contained a thin pad of fungal cells beneath the cuticle, from which, on some of the spots, the fungus had developed cushion-like outgrowths that burst through the cuticle, forming pustules on the surface. These had the stromatic structure of the scab fructifications seen on apple twigs, and bore spores of the *Fusicladium* stage of the fungus. Fragments of the smaller, more superficial spots in culture gave rise to *Fusicladium* spores. Newton Wonder and Bramley's Seedling apples stored in boxes near the Bismarck apples remained unaffected.

It is concluded that this type of injury results from scab infection but appears only after the fruit is picked; whether the original infection takes place before or after picking is at present uncertain. The Bismarck variety is known to be highly susceptible to scab, and the apples had obviously been stored under conditions very favourable to the disease.

To avoid storage scab routine spraying must be systematically practised, a late application of spray being given if required [ibid., xii, p. 32]; the fruit must not be stored wet.

Rawlins (T. E.) & Parker (K. G.). **Influence of rootstocks on the susceptibility of sweet Cherry to the buckskin disease.**—*Phytopath.*, xxiv, 9, pp. 1028–1030, 1934.

Sweet cherry (Napoleon and Black Tartarian) trees on Mahaleb (*Prunus mahaleb*) stock appear to be capable of escaping or resisting natural infection by the graft-infectious buckskin disease [*R.A.M.*, x, p. 528] in California, but such trees were shown in recent experiments to develop severe chlorosis on grafting with diseased Napoleon scions. Trees contracting infection in this way rarely show any symptoms on the fruit, in contrast with those on Mazzard and Morello stocks that exhibit little or no chlorosis but produce conical, prematurely shrivelling fruits with abnormally short pedicels. When diseased and normal susceptible scions were grafted on different branches of Mahaleb seedlings, the former became very chlorotic and made little growth, but the infection did not extend through the Mahaleb tissues to the normal scions, which grew as much as similar scions grafted on check trees.

Grieve (B. J.). **The isolation of the organism causing crown gall on Almond trees in Victoria.**—*Proc. Roy. Soc. Victoria*, N.S., xlvi, 2, pp. 214–219, 1 pl., 1934.

Positive results were obtained on almond, peach, hop, castor oil

plant [*Ricinus communis*], tomato, and sunflower by inoculation with an organism isolated from crown galls on the first-named host in Victoria and considered, in virtue of its morphological, cultural, and physiological characters [which are described], to be identical with *Bacterium tumefaciens* [*R.A.M.*, x, p. 249].

WELLMAN (F. L.). **A disease of Banana, markedly similar to bunchy top, produced by Celery virus 1 in U.S.A.**—*Phytopath.*, xxiv, 9, p. 1032–1034, 1 fig., 1934.

Among several thousand Lady Finger banana plants (*Musa sapientum*) in the Sanford district of Florida were six with symptoms suggestive of virus infection which were destroyed by the owners. Healthy banana plants grown in a greenhouse in insect-proof cages were exposed to aphids carrying the virus originating from cuttings of the same *Commelina nudiflora* plant that yielded the original celery virus strain [see above, p. 93]. One group of diseased *C. nudiflora* shoots was colonized for 14 days with *Aphis gossypii* before the transfer of the latter to the bananas and another with *A. maidis*; neither of these insects has been observed on bananas grown locally. Of the 15 banana plants exposed to *A. gossypii*, 13 became diseased, while both those to which *A. maidis* was transferred contracted infection, the incubation period ranging from 21 to 33 days. Four of the seven controls were infested with virus-free aphids from healthy *C. nudiflora*, and none became diseased.

The third leaf appearing after inoculation was chlorotic, slow to unfurl, frequently drooping, and extensively mottled. Succeeding diseased leaves were tightly rolled, abnormally slow to develop, and brittle; the petioles were mottled, with malformed fibrovascular bundles, and necrotic spots and streaks often occurred on the leaf blade and pseudostem. The reduction of the petioles and leaf blades imparted a stunted, rosette-like appearance to the plants suggestive of bunchy top [*R.A.M.*, xiii, p. 642]. Affected leaf sheaths were retarded in growth and lost some of their flexibility. Partial strangulation of the newest leaves in the centre of the pseudostem was the cause of malformation and occasional splitting of the leaf sheaths. No sign of fruit bud formation could be detected on the dissection of nine of the oldest severely diseased plants.

Typical symptoms of virus infection were also produced by the aphids from diseased *C. nudiflora* on healthy *Commelina*, cucumber, and celery plants, from which the infective principle was readily recovered either by expressed juices rubbed on cucumber cotyledons or by transference by means of *A. gossypii*. Neither of these methods, however, was effective in the isolation of the virus from the infected bananas.

Slight cupping of the leaves, as described by Magee and Ocfemia [ibid., vii, p. 253; ix, p. 384], occurred on two Cavendish banana plants similarly inoculated with viruliferous *A. gossypii*.

The Panama Disease of Bananas Amendment Order 1934.—*Journ. Jamaica Agric. Soc.*, xxxviii, 9, p. 573, 1934.

By the Panama Disease of Bananas Amendment Order, 1934 [cf. *R.A.M.*, xi, p. 80], the Director of Agriculture, Jamaica, is empowered

to prescribe and authorize modifications of the measures to be taken for the treatment of the disease caused by *Fusarium oxysporum cubense.*

Under this Order the Director of Agriculture authorized in August, 1934, certain modifications in the treatment of the disease in the parish of St. Mary. All bananas suffering from Panama disease must be cut down and the base of the plant together with the cut-up debris treated with oil, an area of not less than 6 ft. around the site being dealt with as an infected area [ibid., v, p. 63; xii, p. 38].

In reply to a plea by Mr. U. T. McKay for a general reduction in the number of roots required to be eradicated from nine to one the Director of Agriculture, the Hon. A. C. Barnes, stated (pp. 551–552) that he had recently informed a deputation of representative planters from the parish of St. Catherine that in those districts where the incidence of the disease was so high as to make the usual treatment impracticable the inspectors would be expected to exercise their discretion, but that the Department of Agriculture could not advise the Government to adopt the 1-root treatment in other parishes than St. Mary (where the 9-root system had served its purpose) until the results obtained from it in that parish during at least one year had been ascertained.

SERVAZZI (O.). **Sull'arrossamento fogliare del Kaki (I^a Nota).** [On the leaf reddening of Persimmon (1st Note).]—*La Difesa delle Piante*, xi, 4, pp. 122–137, 5 figs., 1 graph, 1934.

In July 1933, persimmon (*Diospyros kaki*) trees growing at Cavour showed a characteristic leaf discoloration which, beginning as a yellowing at the tip, rapidly caused the whole surface to turn brick-red. The affected leaves remained succulent, but fell prematurely. The histological characters of the condition were consistent with those induced by the approach of cold weather, but a few of the leaves showed the presence of a sparse mycelium, which after exposure to damp conditions in the laboratory was found to be that of a fungus with globose-depressed, later erumpent acervuli measuring 200 to 250 by 50 to 60 μ and fusiform, S-shaped or straight, 6-celled conidia, in which the 4 middle cells were honey-brown and occasionally constricted at the septa, while the apical cell was hyaline, beak-shaped or elongated-conical mucronate and the basal one hyaline and conical or truncated-conical. The mature conidia were rather uniform in shape and size and averaged 37 to 40 μ (including the beak) by 10 to 11·5 μ. The hyaline conidiophores measured 60 to 67 by 1·8 to 2 μ. From its morphological characters the fungus is considered to be a new species of the genus *Coryneum*, which the author names *C. delleanii* with a Latin diagnosis.

In hanging drop cultures in Raulin's medium (P_H 4·6) 80 per cent. of the conidia had germinated after 37 hours, while in neutral media germination was retarded. Germination was usually from the bottom coloured cell, a second germ-tube sometimes growing out from the uppermost or occasionally from one of the middle coloured cells. Before germination the coloured cells became swollen and constricted at the septa. Sometimes spherical bodies (probably secondary conidia) formed after a short growth of the germ-tube. On solid media the optimum growth temperature lay between 25° and 26° C., growth becoming retarded below 20° and above 28° and ceasing at 32°.

Inoculation tests on wounded and unwounded persimmon leaves with suspensions of germinating conidia gave negative results, possibly because adult leaves were used, the juices of which are too acid to favour the growth of the organism. *C. delleanii* is probably a weak parasite of trees exposed to unfavourable conditions.

TURNBULL (J.). **New type of spray for fruit trees.**—*Journ. Min. Agric.*, xli, 5, pp. 433–435, 1 pl., 1934.

A new fixed double spray nozzle of the common disk pattern made by Messrs. Drake and Fletcher of Maidstone is described and figured. The spray starts to widen at less than 1 ft. from the nozzles, where both sprays meet, attains a width of 2ft. at less than 3ft from the nozzles, and maintains that breadth throughout. The length of spray ejected naturally varies with the pressure and also, apparently, with the capacity of the pump; with a good 4 h.p. outfit working at a pressure of 250 lb. per sq. in., two double nozzle leads being used, the effective 'carry' is about 15 ft. The appliance is satisfactory with all kinds of trees from 10 to 30 ft. high, including (if 6 ft. lances and a pressure of 400 lb. are used) the tallest apple trees.

CASABURI (V.). **Employment of synthetic tannins and their metallic salts for disinfecting and stimulating seeds.**—*Internat. Rev. of Agric.*, N.S., xxv, 8, pp. 342–344, 1934.

In tests of the value as seed disinfectants of various natural and synthetic tanning materials, the author (who is Director of the Royal Station for the Hide and Tanning Industry at Naples) states that interesting results have been obtained with the metallic salts of 'alpha' tannin. The latter is a synthetic tanning substance prepared by the sulphonation of betanaphthol and condensation by aldehyde with or without methoxylic groups furnished by the derivatives of cellulose. The mercury salt produced with 'alpha' is really a simple salt of sulphonic acids of the methylenedinaphthols.

This and other metallic salts of synthetic tannins have been mixed with 'dry tan', a special emulsion of paradichlorbenzene adsorbed by talc, and put on the market as a dry disinfectant known as 'uni-dea'. Excellent disinfection of wheat seed-grain against *Tilletia tritici* [*T. caries*] as well as stimulation of germination are stated to have been obtained by the use of uni-dea.

JENSEN (V.) & ØRNER (H.). **Undersøgelser over nogle Stoffers Anvendelighed til Medikamentkonservering. II. Skimmel og lignende.** [Investigations on the applicability of certain substances for the preservation of medicaments. II. Moulds and the like.]—*Dansk Tidsskr. Farm.*, viii, 9, pp. 233–261, 1934.

The writers tabulate and discuss the results of their experiments on the comparative efficacy of a number of chemicals as preservatives against the moulds and yeasts shown by isolation experiments to occur in pharmaceutical preparations in Denmark, e.g., *Aspergillus glaucus* in Sol. cocaini hydrochloridi, *A. flavus* in Extr. Pini silvestris, *A. niger* in Sol. natrii arsenalis, *A. fumigatus* in Syr. Papaveris, *Penicillium glaucum* in Syr. Seneg. and Sol. morphini hydrochloridi, *Citromyces*

pfefferianus in Sørensen's citrate solution, *Cladosporium herbarum* in Iodum colloidale and Sol. kalii chloratis, *Dematium* [*Pullularia*] *pullulans* [*R.A.M.*, xiv, p. 2] in Inf. Valerianae, *Mucor racemosus* in Tablet. novocaini, *M. mucedo* in Tabl. ovariae, and *Rhizopus nigricans* in Ung. cetacei and Extr. Belladon.

The organisms grew well on a number of standard media (mostly fruit), of which banana agar proved to be the cheapest and most readily obtainable. In the preservation tests the chemicals were added in appropriate concentrations to cultures of the organisms in 2 per cent. dextrose bouillon. Among the more promising substances were the following. Quinosol [ibid., xiv, p. 9] destroyed all the species of *Aspergillus* at 1 in 1,000 in 48 hours, *A. glaucus* succumbing at 1 in 1,500, as also did *Citromyces pfefferianus* and *P. pullulans*. One of the two strains of *Penicillium glaucum*, *Cladosporium herbarum*, *M. mucedo*, and *R. nigricans* proved more resistant, requiring concentrations of 1 in 600 to produce a lethal effect, while a strength of 1 in 500 was necessary to kill *M. racemosus* in the same time. Hexylresorcinol [see above, p. 105] destroyed *C. herbarum* at 1 in 4,000 in 48 hours and one strain each of *A. fumigatus* and *P. glaucum* at 1 in 1,500, the other moulds requiring intermediate strengths. Brilliant green [see above, p. 105] was lethal in 48 hours to all the species of *Aspergillus* and the two of *Mucor* at 1 in 5,000, to *C. herbarum* at 1 in 4,000, and to *P. glaucum* and *Citromyces pfefferianus* at 1 in 2,500. Malachite green destroyed *C. pfefferianus* in 48 hours at 1 in 6,000, *Pullularia pullulans* at 1 in 3,000, and the rest at intermediate strengths.

Data are also given concerning the effects of the chemicals on two species of *Saccharomyces* and two of *Torula*, and comparative figures are included in a final table for [unspecified] bacteria used in a previous series of trials.

Brown (J. G.) & Streets (R. B.). **Diseases of field crops in Arizona.**—*Arizona Agric. Exper. Stat. Bull.* 148, pp. 85–228, 57 figs., 1 diag., 1 map, 1934.

This comprehensive and well-illustrated publication opens with a key to the most important fungal and bacterial diseases [arranged by the hosts] of the chief field crops in Arizona. The diseases are dealt with in semi-popular terms, including a brief account of their relative economic importance, spread in the State, external symptoms, and control; preventive measures, namely, seed treatments and soil disinfection, are discussed at some length in a final section.

Robbins (W. J.). **Isolation of the infective principle of virus diseases.**—*Science*, N.S., lxxx, 2073, pp. 275–276, 1934.

After briefly reviewing some recent estimates of the dimensions of the tobacco mosaic and other viruses [*R.A.M.*, xiii, p. 588], the writer presents a table showing how great the number of infective particles per c.c. of juice must be if an appreciable quantity of an infective principle of molecular weight of the order of 100,000 can be isolated from a reasonable quantity of juice. From the available data it is apparent that if 0·1 gm. of infective material of molecular weight of 100,000 exists in 6 l. of juice the number of infective particles would

necessarily be 10^{14} per c.c., or one million times as high as indicated by the work of previous investigators.

SUKHOFF (K. S.) & LANSHINA (Mme M. N.). Патологические изменения в растительных клетках при действии иодистого калия. (В связи с вопросом о природе Х-тел). Предварительное сообщение. [Pathological changes in plant cells caused by the action of potassium iodide. (In connexion with the problem of the nature of the X-bodies.) Preliminary communication.]—ex *Вирусные болезни растений в Крыму и на Украине* [*Virus diseases of plants in the Crimea and the Ukraine*], pp. 122–124, 3 figs., Госуд. Издат. Крым [State Publ. Office for the Crimea], Simferopol, 1934. [German summary.]

The authors state that they found intracellular inclusions, closely resembling the X-bodies found by other workers in the cells of plants affected with virus diseases, in the growing point of beet seedlings watered with a 0·01 per cent. potassium iodide solution, which is stated to cause a necrosis of the seedlings (Schmidt. Ueber Jodnekrose an Zuckerrübenkeim: *Angew. Bot.*, [xiv, p. 229], 1932) [cf. *R.A.M.*, xiv, p. 51]. Such inclusions were absent from the cells of untreated beet seedlings.

KOSTOFF (D.). **Inheritance of natural immunity in plants with special reference to breeding of immune varieties.**—*Zeitschr. für Züchtung*, A, xix, 4, pp. 550–576, 1934.

Following a brief outline and discussion of the nature of immunity in plants, the influence of environmental factors on resistance to disease, and the nature of pathogens, the author, writing from the Genetic Laboratory of the Academy of Sciences, Leningrad, defines the present status of genetic research on natural immunity in plants in the light of contemporary investigations [cf. *R.A.M.*, xiii, pp. 390, 718]. A nine-page bibliography is appended.

MIKHAILOVA (Mme P. V.) & PIVOVAROVA (Mme R. M.). Об анатомическом методе диагностики вирусных болезней Картофеля. [Considerations on the anatomical method of diagnosing virus diseases of the Potato.]—ex *Вирусные болезни растений в Крыму и на Украине* [*Virus diseases of plants in the Crimea and the Ukraine*], pp. 93–108, Госуд. Издат. Крым [State Publ. Office for the Crimea], Simferopol, 1934. [German summary.]

After a brief discussion of the difficulties presented by the differential diagnosis of potato virus diseases, the authors give a tabulated account of their studies in the attempt to differentiate the diseases of this group that occur in the Ukraine by the anatomical changes caused by each in the different tissues of the hosts, more particularly in the tubers. The results [given in a table] incline them to accept Quanjer's classification [*R.A.M.*, x, p. 746] rather than the views expressed by von Brehmer and Rokhlina [ibid., xi, p. 121]. They distinguish in the Ukraine: (*a*) anecrotic mosaic (aucuba); (*b*) necrotic mosaic (streak or rugose mosaic, which are considered to be identical); and (*c*) phloem

necrosis (leaf roll), the anatomical symptoms of which are described in some detail.

The results of microchemical tests of the tissues in process of necrosis indicated that the browning of the cells and other chemical changes begin before the death of the cells. On general lines, the anatomical method of differentiation of the virus diseases is considered to be a very promising one.

Ryjkoff (V. L.) & Mikhailova (Mme P. V.). О природе **Pseudocommunis sp.** [On the nature of *Pseudocommunis* sp.]—ex *Вирусные болезни растений в Крыму и на Украине* [*Virus diseases of plants in the Crimea and the Ukraine*], pp. 114–121, 5 figs., Госуд. Издат. Крым [State Publ. Office for the Crimea], Simferopol, 1934. [German summary.]

The authors state that in their cytological studies of potato tubers affected with various virus diseases in the Ukraine they constantly found the presence in the neighbourhood of necrotic spots of intracellular bodies apparently identical with Debray's description and figures of *Pseudocommunis* [*Pseudocommis*] *vitis* [*Rev. de Vitic.*, 1895]. These bodies were also occasionally seen in the tissues of virus-diseased potato stems. Microchemical tests [details of which are given] showed that they are a product of cell metabolism under the influence of certain pathological processes [cf. *R.A.M.*, i, p. 72].

Sanford (G. B.). **A malady of the Potato in Alberta similar to psyllid yellows.**—*Scient. Agric.*, xv, 1, pp. 46–48, 1 pl., 1934.

The author states that potato crops in central Alberta have been sporadically affected since 1919, with the exception of a few years, by a pathological condition closely resembling the psyllid yellows described from Utah [*R.A.M.*, xii, p. 461]. In 1932 the trouble broke out very severely in and about Medicine Hat in southern Alberta, where over 100 acres of the crop were totally destroyed by it, and tomato plants near by were similarly affected; it did not recur in 1933. It is pointed out that four species of *Paratrioza* are known to occur in Alberta, but *P. cockerelli*, the insect responsible for initiating the disease in Utah, has not been definitely recorded from the province.

Holmes Smith (E.). **Sprain(g) or internal brown fleck of Potatoes. (Pseudomonas solaniolens, Paine.)**—*Gard. Chron.*, xcvi, 2489, pp. 178–179, 2 figs., 1934.

Reporting an attack of spraing (*Pseudomonas solaniolens*) [*R.A.M.*, iii, p. 420; xiii, p. 650] on a four- to five-acre stand of Ninetyfold potatoes at Northwich, Cheshire, in June, 1934, the writer briefly surveys the available information on the disease and describes some personal observations on it. In the Northwich case some diseased tubers were inadvertently included among the seed used for planting, and evidently the combination of light soil and a dry season so favoured the disease as to induce its recurrence in an intensified form, every plant in the drills in which the infected seed tubers had been planted producing only a few half-sized tubers all showing spraing. From all accounts this disease has been exceptionally prevalent in 1933 and 1934 in parts of England and on the Continent.

Wheeler (E. J.) & Moore (H. C.). **Potato seed treatment tests.**—*Michigan Agric. Exper. Stat. Special Bull.* 246, 19 pp., 5 figs., 1933. [Received December, 1934.]

Satisfactory scab [*Actinomyces scabies*] control was not given by seed potato treatment with mercuric chloride or semesan bel in six years' experiments [the results of which are fully tabulated and discussed] in Michigan [*R.A.M.*, xiii, p. 536]. Under the same soil conditions the Irish Cobbler variety showed a high degree of susceptibility to scab while Russet Rural proved fairly resistant. In general, clean untreated seed gave higher yields than diseased treated seed. Semesan bel, Bayer dip dust, and sanoseed gave practically the same results in all the trials and none was superior to mercuric chloride in scab control. Both with scab and black scurf (*Rhizoctonia*) [*Corticium solani*: ibid., xiii, p. 496] a longer treatment than half an hour's immersion in 30 galls. mercuric chloride solution (4 oz. in 30 galls. water) did not improve control, the yield differences in fact being in favour of the shorter period (9·5 and 11·8 bushels increase with Cobblers and Rurals, respectively). Hot formaldehyde, calomel (mercurous chloride), and acidulated mercuric chloride were no more effective than the standard mercuric chloride in disease control, and the first-named showed a marked tendency to reduce the yields. The chemical analysis of mercuric chloride solutions after treating eight lots of seed by renewing the solution four times showed that nearly 2 oz. more mercuric chloride per 30 galls. was present than before the commencement of treatment.

Soil conditions are evidently of greater importance than seed treatment in the prevention of scab and *C. solani*, especially the former. Some evidence was obtained that sulphur (250 to 600 lb. per acre) may give good control of *A. scabies*, while in one series of tests in 1932 promising results were given by aluminium sulphate (50 or 25 lb. per acre), copper sulphate (250 lb.), semesan bel (50 lb.), and mercuric oxide (15 lb.). Cultural measures tending to decrease the incidence of scab are briefly indicated.

Schaal (L. A.). **Relation of the Potato flea beetle to common scab infection of Potatoes.**—*Journ. Agric. Res.*, xlix, 3, pp. 251–258, 4 figs., 1934.

The results of the experiments briefly described in this paper showed that under field conditions in the Greeley area of Colorado the larvae of the potato flea beetle (*Epitrix cucumeris*) carry the organism of potato common scab (*Actinomyces scabies*) both internally and externally, and thus may cause scab infection of the potato tubers on which they feed. Aseptically hatched larvae did not contain the organism.

Lauritzen (J. I.) & Harter (L. L.). **Prevent storage rot of Sweet Potatoes.**—*U.S. Dept. of Agric. Leaflet* 106, 6 pp., 3 figs., 1934.

Directions are given for the prevention of black rot [*Ceratostomella fimbriata*], surface rot [*Fusarium oxysporum*], Java black rot [*Diplodia tubericola*], *Fusarium* rot, and *Rhizopus* soft rot among stored sweet potatoes [*R.A.M.*, iv, p. 699; ix, p. 290; xi, p. 535 *et passim*] by careful

handling, thorough cleaning and disinfection of the storage house, ten days' curing at a temperature of 80 to 85° F. and a relative humidity of 90 per cent., followed by an adjustment to 55° and 85 to 90 per cent., respectively, for the remainder of the storage period, and (for black rot) eight minutes' immersion of the roots in mercuric chloride (1 oz. in 8 galls. water).

LOH (T. C.). **An improved method for the control of seed-borne diseases of Rice.**—*Lingnan Sci. Journ.*, Canton, China, xiii, 4, pp. 603–605, 1934.

Very satisfactory control of seed-borne rice diseases is stated to have been obtained in the Canton district of China by a modification of the hot mercuric chloride treatment, in which 25 to 30 minutes' immersion in a cold 1 per cent. mercuric chloride solution is preceded by several hours' soaking of the infected grains under a suction pump. An electric suction pump accomplishes the necessary work about three times faster than an ordinary water pump or hand exhauster. Surplus water should be drained off the grains before their immersion in the mercuric chloride solution.

GONÇALVES DA CUNHA (A.) & BENSAUDE (MATILDE). **Sur l'existence d'une Pythiacée sur le Riz au Portugal.** [On the occurrence of a member of the Pythiaceae on Rice in Portugal.]—*Comptes rendus Soc. de Biol.*, cxvii, 33, pp. 733–734, 1934.

In May, 1934, the writers examined a sample of rice seeds from Benavente, none of which had germinated. Each seed was enveloped in a fragile mucilaginous sheath, which was found to consist of a bacterial zoogloea permeated by the non-septate hyphae of a Pythiaceous fungus. Cultured in Petri's solution, these hyphae produced abundant piriform zoosporangia of considerable dimensions which liberated numerous uniciliate, reniform zoospores. All that remained of the affected seeds was their external layers, the embryo and albumin having been almost completely destroyed.

Destructive rice diseases caused by *Pythiomorpha miyabeana* and *P. oryzae* (referred by Miss C. Buisman to *Phytophthora*) have been reported from Japan [*R.A.M.*, xi, p. 397], while a *Pythium* is recorded from Java as an agent of infection in rice fields [ibid., x, p. 298]. Taxonomic studies on the Portuguese fungus are in progress.

TULLIS (E. C.), JONES (J. W.), & DAVIS (L. L.). **The occurrence of stem rot of Rice in California.**—*Phytopath.*, xxiv, 9, p. 1047, 1934.

Stem rot of rice (*Leptosphaeria salvinii*) [*R.A.M.*, xiii, p. 395] was observed in the conidial [*Helminthosporium sigmoideum*] and sclerotial [*Sclerotium oryzae*] stages in California in 1932 on a stand of Early Prolific grown from Arkansas seed on which the fungus was presumably introduced in 1931. In 1933 the disease was again found on the same variety in a commercial field and on six others in experimental plots.

Endo (S.). **Influence of salt on the pathogenicity of Hypochnus sasakii Shirai.**—*Trans. Tottori Soc. Agric. Sci.*, iv, 3, pp. 362–367, 1933. [Abs. in *Biol. Abstracts*, viii, 8, p. 1908, 1934.]

The pathogenicity of *Hypochnus* [*Corticium*] *sasakii* on rice seedlings in Japan [*R.A.M.*, xiii, p. 725] was found to be greatly influenced by the addition of salt to the soil or sand in which the plants were grown, infection being absent when salt concentrations of 1 per cent. or more were reached. The growth of the mycelium on culture media was depressed by the addition of salt, being inhibited at a strength of 5 per cent. or above. The rice plants themselves were also retarded in growth by the salt treatment.

Reyes (G. M.). **A new or little-known Rice disease occurring in the Philippines.**—*Philipp. Journ. of Agric.*, v, 3, pp. 123–141, 6 pl., 1934.

A description is given of a hitherto unrecognized *Fusarium* infection causing foot rot and wilt of rice over a limited area in Rizal Province, Philippine Islands. The initial yellowing of the outer leaves is followed by wilting of the younger foliage and finally by the death of the plant. Frequently one or more tillers in a stool turn yellow or die while the rest remain outwardly healthy. The vascular tissues of infected plants show a brown discoloration, and on splitting the stems in an advanced stage of decay a dense accumulation of fungal growth may be found in the hollows round the nodes. White or pale salmon-coloured fungal outgrowths may also be seen from ground level upwards on the sheaths and stems in advanced cases.

Morphological and physiological studies on the causal organism indicate that it is probably identical either with the *Fusarium* stage of *Gibberella moniliformis* (*F. moniliforme*) or with that of *G. fujikuroi* [*R.A.M.*, xii, p. 590; xiii, p. 801].

The pathogenicity of the fungus has been demonstrated by inoculation experiments, successful infection being obtained either by placing the fungus between the two outermost leaf sheaths or by spraying the top of the plant with a spore suspension in water. The former method was the most effective. Soil inoculations gave a lesser percentage of successes, and there was no evidence that the disease is seed-borne. Infection progresses rather slowly and the disease is not considered to be particularly virulent. Control measures should include the destruction of diseased material, protracted crop rotation, and the cultivation of resistant varieties, such as Biñan, Matayosa, Visaya, Guinagang Str. 1, Gallano, and Kinatuday.

Todd (Ramona L.). **Fungi at various depths in typical Cleveland County, Oklahoma soils.**—Reprinted from *Proc. Oklahoma Acad. Sci.*, xiv, 4 pp., 1 diag., 1 graph, 1934.

This is an expanded account of the writer's statistical investigations, covering a period of one year, on the fungi occurring at various depths in typical soils of Cleveland County, Oklahoma, a preliminary note on which, giving the essential information, has already appeared [*R.A.M.*, xii, p. 324].

JENSEN (H. L.). **Contributions to the microbiology of Australian soils. I. Numbers of micro-organisms in soil, and their relation to certain external factors.**—*Proc. Linn. Soc. New South Wales*, lix, 3–4, pp. 101–117, 3 graphs, 1934.

The results obtained [which are tabulated and fully discussed] in a study of the numbers of micro-organisms present in fifty soils from New South Wales, and their relation to certain external factors showed that a correlation obtained between the organic content and the numbers of bacteria, actinomycetes, and fungi, most pronounced in the case of bacteria and least in that of actinomycetes. Soil reaction had no effect on the numbers of bacteria and actinomycetes but was significantly correlated with the numbers of fungi. The ratio of fungi to bacteria + actinomycetes was correlated with soil reaction except in the case of soils abnormally poor in the two last-named groups. In this series of observations moisture content had no influence on any of the three groups, but several soils from dry areas were very poor in fungi.

Periodical counts in a soil from Sydney showed a strong positive correlation between moisture content and numbers of bacteria and a less pronounced one between moisture and numbers of fungi. None of the three groups of organisms showed any correlation with temperature or any seasonal changes in numbers save those resulting from changes in moisture [*R.A.M.*, xii, pp. 140, 721].

A bibliography of 28 titles is appended.

OLSEN (C.). **The absorption of manganese by plants.**—*Comptes-rendus Trav. Lab. Carlsberg*, xx, 2, 34 pp., 2 figs., 10 graphs, 1934.

A detailed, tabulated account is given of the writer's investigations in Denmark on the manganese (and in some cases also the iron) content of the leaves of various wild plants. Barley and buckwheat collected from soils of varying hydrogen-ion concentrations were grown in artificial soil mixtures of different P_H values. A further series of tests was made to determine the iron and manganese contents of plants grown in water cultures with and without manganese. Analyses are also given of the manganese content of various cultivated plants from grey speck soil before and after the addition of manganous sulphate [*R.A.M.*, xii, p. 19, and next abstract].

It was found that land plants growing under natural conditions absorb increasing amounts of manganese with a rising hydrogen-ion concentration of the soil, so that in strongly acid soils they contain an excess of manganese over iron. However, in plants grown in water cultures of differing P_H values but a constant concentration of manganous sulphate, the maximum amount of manganese was absorbed between P_H 6 and 7. Oats do not suffer from grey speck in all soils with a P_H value exceeding 7, and in basic soils the presence or absence of the disorder seems to depend chiefly on the structure and humidity of the soil. Thus, the disease is less severe on clay than on sand and on moist than on dry soil. It has further been observed that plants are not affected by grey speck disease in places where the soil is firmly compressed, e.g., by deep wheel tracks. Evidently, therefore, the extent of oxygen access is decisive for the development of the disturbance; any reduction in the oxygen content

of the soil resulting from compression or liberal watering facilitates the formation of small quantities of manganous salts assimilable by the plants. The well-established curative action of manganous sulphate on oats in grey speck-diseased soil appears to persist for several years, during which time it is converted into manganese dioxide.

WILD (A. S.). **Further field experiments with manganese as a control of grey speck disease in Western Australia.**—*Journ. Dept. of Agric. Western Australia*, xi (Ser. 2), 2, pp. 223–225, 1934.

A concise, tabulated account is given of experiments conducted at Tinkurrin, Western Australia, in the control of grey speck disease of Bencubbin wheat [*R.A.M.*, ix, p. 741, and preceding abstract] by the application to the soil of manganese sulphate at the rate of 14 or 56 lb. per acre in addition to the ordinary superphosphate dressing (112 lb. per acre). The best results were given by the smaller application of manganese sulphate, the plots thus treated yielding an average of 21 bushels 48 lb. per acre as compared with 15 bushels 28 lb. for the higher rate and 13 bushels 34 lb. for the controls. It is estimated that applications of manganese sulphate ranging from 14 to 28 lb. per acre will adequately combat the manganese deficiency disease of wheat and oats on the slightly acid, non-calcareous soils, containing a fairly high proportion of ferruginous (lateritic) gravel, of the district.

MCRAE (W.). **Foot-rot diseases of Piper betle L. in Bengal.**—*Indian Journ. Agric. Sci.*, iv, 4, pp. 585–617, 1 diag., 1934.

This is a detailed report of the author's investigation of the foot rot of betel vines (*Piper betle*) [*R.A.M.*, xiii, p. 12], which is stated to be very prevalent in all betel vine-growing areas of India. The earliest symptom of the disorder is a darkening of the stem at the 'foot' of the plant near ground level; this is soon followed by a wilt of the diseased stems, the cortex of which undergoes a soft and sometimes slimy rotting, usually over about three nodes and internodes. The disease, which was shown to be localized to the discoloured parts of the stems, was found to be associated with several fungi, including *Glomerella cingulata* which, however, proved to be incapable by itself of producing disease symptoms in betel vines, though when placed on a lesion caused by *Phytophthora*, it grew rapidly and accentuated the symptoms.

Of the three species isolated from diseased vines which have been demonstrated to be pathogenic, comparative cultural and inoculation studies [considerable details of which are given] showed two to be *Rhizoctonia* [*Corticium*] *solani* and *Sclerotium rolfsii*, the latter being relatively unimportant in Bengal, while the former causes damage to the vines soon after the rains and in the early part of winter. The third fungus, which is responsible for much of the damage done in Bengal, was found to be referable to *P. parasitica*, a strain of which, causing a similar disease of betel vines, was also obtained from Malaya [cf. ibid., xii, p. 355]; a third strain from Madras, also causing a foot rot of the vines, appeared to be different in its sporangial measurements, and its systematic position still remains to be determined.

In comparative inoculations with *P. colocasiae* from *Colocasia antiquorum* (Pusa) and *P. palmivora* from *Borassus flabelliformis* (Godavari)

it was found that the spots produced on *C. antiquorum* by the other species of *Phytophthora* were quite different from those produced by *P. colocasiae*, while only the strains of *P. parasitica* from *Ricinus communis* (Pusa) and the fungi isolated from betel vine could infect *R. communis*. A statistical examination of the conidial dimensions of these and some other allied species showed that *P. colocasiae*, *P. meadii* from *Hevea* rubber (Cochin), *P. faberi* [source not stated], and the Madras betel *Phytophthora* were significantly distinct from one another and from *P. parasitica* and the other two betel strains. The three last-named, however, were closely similar and also came rather near *P. palmivora*.

Cultural experiments indicated that temperatures between 20° and 30° C. were the most favourable for the growth of the three betel pathogens, the optimum for *C. solani* appearing to be towards the lower end of this range, while *S. rolfsii* and *P. parasitica* seemed to be favoured by slightly higher temperatures. The thermal death point for *C. solani* was about 51°, for *S. rolfsii* 55°, and for *P. parasitica* 48°.

The paper terminates with a brief discussion of control measures, most of which have already been noticed from other sources [ibid., xii, p. 420].

SUMMERS (E. M.). **Types of mosaic on Sugar Cane in Louisiana.**—*Phytopath.*, xxiv, 9, pp. 1040–1042, 1 fig., 1934.

In 1932 two quite distinct types of mosaic, (1) mild and (2) severe, were observed occurring spontaneously on adjacent stools of a single seedling variety, C.P. 28/60, in the United States Department of Agriculture nurseries at Houma, Louisiana. In 1933 two further types, (3) and (4), were collected in commercial fields of Co. 281. All four types have persisted without apparent change through successive vegetative propagations of the diseased plants, and were also readily perpetuated on differential varieties by needle-prick inoculations. On healthy Co. 281, Louisiana Purple, and P.O.J. 36-M, 213, and 234, types (1), (2), and (4) gave only indistinguishable mosaic symptoms. On C.P. 28/60, however, these types invariably reproduce their characteristic leaf patterns, while type (3) reproduced on all the test varieties its distinctive yellowish-white stripes. Type (4) is indistinguishable from (3) on C.P. 28/60 but invariably produced the ordinary mosaic pattern on Louisiana Purple, on which (3) causes severe striping.

The characteristic striping of type (3) consists of elongated, nearly white blotches or islands, some of which coalesce into long, yellowish-white streaks, following the midrib and often accompanied by severe necrosis involving temporary or permanent blighting of the growing point. It appears to be very limited in distribution.

KUPLENSKAYA (Mme O. I.). **Physiological investigation of microorganisms, Fusarium betae, Macrosporium commune and Verticillium lateritium.**—*Trans. Central Sci. Res. Inst. Sugar Ind.* (U.S.S.R.), 12, pp. 54–63, 1933. [Abs. in *Chem. Abstracts*, xxviii, 20, pp. 6774–6775, 1934.]

Fusarium betae [*F. merismoides* var. *majus*: *R.A.M.*, xi, p. 624] inverts cane sugar, consuming the products of inversion. Alcohol and organic acids are formed in the biological process. The fungus is able to

decompose the pectin substances, and can grow between P_H 2·5 and 9 without requiring much aeration. It is resistant to antiseptics and withstands low temperatures. *Macrosporium commune* [? *Pleospora herbarum*: ibid., xiii, p. 795] also inverts cane sugar, but does not consume the products as rapidly as the foregoing. It grows best between P_H 3·5 and 8·2. *Verticillium lateritium* [ibid., ix, p. 58], on the other hand, inverts cane sugar slowly, is very sensitive to temperature variations, and can exist only within a limited P_H range.

HERBERT (D. A.). **Records of Queensland fungi.—I.**—*Queensland Naturalist*, ix, 3, pp. 44–46, 1934.

A list is given of 21 species of fungi supplementary to that given in F. M. Bailey's catalogue of Queensland plants and not including the numerous records of pathogenic fungi made by the officers of the Department of Agriculture and Stock.

PETRAK (F.). **Mykologische Notizen. XII.** [Mycological notes. XII.]—*Ann. Mycol.*, xxxii, 5–6, pp. 317–447, 1934.

Critical and taxonomic notes are given on Nos. 751 to 850 of the present series of fungi [cf. *R.A.M.*, xi, p. 328]. *Physalospora perseae* Doidge, the agent of a serious disease of avocado pears (*Persea americana*) [*P. gratissima*] in South Africa [ibid., iii, p. 92] is redescribed, considered to be a typical *Melanops*, and renamed *M. perseae* (Doidge) Petrak. It is characterized by depressed-spherical, broadly ellipsoid, elongated to conical or irregular, carbonaceous, ostiolate perithecia, 100 to 140 μ in height, 130 to 200 μ in breadth; clavate, short-stalked or subsessile, thick-walled asci, 70 to 90 by 16 to 22 μ, each containing eight elongated or extended-ellipsoidal to clavate or extended-oval, hyaline, unicellular ascospores, 18 to 23 by 7·5 to 10 μ; and profusely branched, septate paraphyses, 2 to 3 μ in width.

DRECHSLER (C.). **Phytopathological and taxonomic aspects of Ophiobolus, Pyrenophora, Helminthosporium, and a new genus Cochliobolus.**—*Phytopath.*, xxiv, 9, pp. 953–983, 3 figs., 1934.

A very fully documented discussion is given of the historical, taxonomic, and morphological position of the genus *Ophiobolus*, the interest of which in the phytopathological sphere centres mainly round *O. graminis* and *O. herpotrichus* [*R.A.M.*, xiii, p. 297]. The latter, not hitherto reported in the United States, has been found of recent years to occur extensively on dead quack grass (*Agropyron repens*) stems from April to early June in Wisconsin, New York, Maryland, and Virginia. Its early implication in the causation of foot rot of cereals in Italy and Germany is thought to be due to a failure to recognize the difference between it and *O. graminis*. It is now, however, considered in Germany and Holland to be a parasite of secondary importance, in agreement with the position long held in France [ibid., ix, p. 586; x, p. 446; xiii, p. 569]. Neither these two closely related species nor *O. oryzinus* [ibid., xii, p. 655], probably a member of the same series, appear to be nearly related to the generality of forms comprised in *Ophiobolus* [which are enumerated], or with the helicoid ascigerous series of graminicolous

species with bipolar germination referred in their conidial stage to *Helminthosporium*.

Of the general run of species in *Ophiobolus*, more asexual stages are recorded of the *Phoma* type than of any other. *Phoma* stages developed in cultures of *O. fulgidus* isolated from *Ambrosia trifida* and also in a second species from the same host, often but incorrectly referred to *O. fulgidus*.

Of more than a dozen miscellaneous species of *Ophiobolus* from various hosts, none gave rise in maize meal agar cultures to a *Helminthosporium* stage or showed any resemblance in cultural or mycelial habit to representatives of the latter genus. It is concluded, therefore, that the helicoid ascigerous series of the *Ophiobolus* type, having a *Helminthosporium* conidial stage, constitutes a separate natural genus, to which the name *Cochliobolus* is given [with Latin and English diagnoses]. This genus has as its type species *C. heterostrophus* nov. comb. (*O. heterostrophus*) [ibid., vi, p. 547], a fungus causing leaf spot of maize.

The filamentous outgrowths sometimes occurring on *Cochliobolus* perithecia are considered to be intrusions of the vegetative and asexual reproductive stages rather than an integral feature of the ascigerous stage. Excessive emphasis on the presence or absence of setose excrescences as criteria for the differentiation of *Pyrenophora* and *Pleospora* is thought to have obscured the much more important and stable morphological divergences between these two genera. Through the elevation of *Chaetoplea* to generic rank by Clements and Shear (The genera of fungi. H. Wilson Co., New York, 1931) *Pyrenophora* is automatically rehabilitated as a natural genus in the sense defined and applied by Fuckel, being reserved for the hard sclerotioid perithecial forms having their asexual stages in the *Helminthosporium* forms such as *H. teres*, *H. bromi*, and *H. tritici-repentis* [see above, p. 90] with indiscriminate germination, corresponding broadly with Nisikado's subgenus *Cylindro-Helminthosporium* and Ito's genus *Drechslera* [*R.A.M.*, x, p. 233].

A bibliography of 80 titles is appended.

Mundkur (B. B.). **Perfect stage of Sclerotium rolfsii Sacc. in pure culture. (Preliminary announcement.)**—*Indian Journ. Agric. Sci.*, iv, 4, pp. 779–781, 1 pl., 1934.

Four Indian isolations of *Sclerotium rolfsii* from wilted cotton, betel vines (*Piper betle*), potato, and sugar-cane plants, produced a basidial stage on a special medium containing onions, asparagin, and proteose peptone [the preparation of which is described]. This stage appeared in from 40 to 45 days in cultures kept at a temperature of 30° to 31° C. which promotes the optimum growth of the fungus. It is stated to agree with Curzi's description of *Corticium rolfsii* [*R.A.M.*, xi, p. 749], and is tentatively referred to this species. The basidia are produced on dense white cushions and are rather short and aggregated in a crust 6 to 12 mm. in diameter. They are hyaline, septate at the base, clavate, and sometimes furnished with two, three, or four sterigmata, 3 to 5 μ long. Most of them, however, remain sterile. The basidiospores are obovate, globose, or slightly cylindrical, and measure 4·9 to 9·4 μ (mean 6·8$\pm$0·067 μ) by 2·6 to 7·1 μ (mean 4·9$\pm$0·057 μ).

Bugnicourt [F.]. **Premières observations sur les maladies du Tabac dans le sud-indochinois programme d'études.** [Preliminary observations on Tobacco diseases in the southern Indo-Chinese study programme.]—*Bull. Écon. Indochine*, N.S., xxxvii, pp. 717–721, 3 pl., 1934.

Preliminary notes are given on the following tobacco diseases in southern Indo-China which are to form the object of more extensive pathological studies by the staff of the Agricultural Research Institute: mosaic (of widespread occurrence and causing heavy damage to 25 to 60 per cent. of the crop); wilts due to *Fusarium oxysporum* var. *nicotianae* and *Bacillus* [*Bacterium*] *solanacearum*, also responsible for heavy losses; *Phytophthora* [*parasitica* var.] *nicotianae*; wildfire (*Bact. tabacum*), hitherto observed only on old plants in the Govap and Hoc-mon districts; and sooty moulds, which impair the marketable value of the leaves.

Kheswalla (K. F.). **Stem rot of Tobacco caused by Sclerotinia sclerotiorum (Lib.) de Bary.**—*Indian Journ. Agric. Sci.*, iv, 4, pp. 663–673, 4 pl., 1934.

The investigation in 1932 of a serious outbreak of a rot at ground level of the stems of tobacco at the Tobacco Farm at Rangpur, Bengal, showed the disease to be caused by *Sclerotinia sclerotiorum* [*R.A.M.*, xii, p. 729]. The fungus grew best at temperatures between 20° and 25° C., but no growth was made at 30°. In rich media microconidia were produced late, when the available food was used up by the fungus, while in poor media they formed within a short time. Mature apothecia were produced from sclerotia formed in culture and on the host, and tests showed that the ascospores can infect wounded tobacco leaves; in one experiment the ascospores infected one out of eight uninjured leaves that were sprayed with a spore suspension. Low temperature was found to be one of the factors determining the development of apothecial stalks, and light is essential for their expansion into disks. A *Botrytis* stage was not found in the life-history of this fungus.

Holmes (F. O.). **Inheritance of ability to localize Tobacco-mosaic virus.**—*Phytopath.*, xxiv, 9, pp. 984–1002, 3 figs., 1934.

The localization of the tobacco mosaic virus in the neighbourhood of the infected spots, so that it does not become systemic [*R.A.M.*, xiv, p. 61], in hybrids between (1) the Tabasco and Ruby King and (2) the Golden Dawn and *minimum* varieties of garden pepper (*Capsicum frutescens*) [*C. annuum*] was shown by tests [details of which are given] to be determined by a dominant Mendelian factor. In plants possessing this factor (of which this is believed to be the first record in connexion with a virus disease) the infective principle increased in tissues at the site of inoculation, causing the development of numerous small, necrotic areas, followed by the early abscission of the inoculated leaf and subsequent healthy growth of the plant to maturity. The recessive allelo-

morphs, on the other hand, responded to inoculation by systemic extension of the virus, stunting of the plant, foliar mottling and distortion, and reduced yield of fruit.

Somewhat similar genetic factors, determining a necrotic response, were found to operate in a number of crosses between species of *Nicotiana* (e.g., *N. caudigera* × *N. acuminata* and *N. sanderae* × *N. langsdorffii*), as well as in eggplant varietal crosses (Peking Green × Black Beauty and Hangchow Long × Black Beauty).

WHITE (P. R.). **Multiplication of the viruses of Tobacco and aucuba mosaics in growing excised Tomato root tips.**—*Phytopath.*, xxiv, 9, pp. 1003–1011, 1 graph, 1934.

Making use of the fact that the root tips of tomato are capable of apparently indefinite growth in an isolated state under controlled environmental conditions, the author has cultivated the viruses of tobacco and aucuba (tomato) mosaic [*R.A.M.*, xiii, pp. 648, 661] in tomato root tips grown *in vitro*. The stem of a rapidly growing Bonny Best tomato, heavily infected by tobacco mosaic, was cut into segments which were thoroughly washed and suspended in 3-litre Erlenmeyer flasks containing a little water in such a way as to touch neither the flask nor the water. After 11 days 18 root tips were removed from the basal portions of the cuttings and placed in flasks containing 50 ml. of a nutrient medium [the composition of which is indicated]. Of the 18 roots cultured only six survived, and after a week these were cut into pieces some 10 mm. in length; the apices and some subapical portions were transferred to fresh flasks, while the discarded basal parts were tested for the presence of virus by crushing and rubbing into *Nicotiana glutinosa* leaves. Virus was found to occur in all six roots, the number of lesions produced by individuals ranging from 22 to 500. A single root tip was selected to serve as the parent stock for subsequent cultures.

The clone was grown in the laboratory and subcultured weekly for a period of 30 weeks. At the fourth passage it comprised 50 cultures, and this number was maintained up to and including the seventh passage, after which the number was reduced to 25. At the end of the 20th and 30th passages, inoculations were made from cultures Nos. 5, 10, 15, 20, and 25 into tobacco and *N. sylvestris* plants, while at the same time, tissue from each root was inoculated into a leaf of *N. glutinosa*. Characteristic local lesions were induced on the latter by every culture except No. 25, the failure of which was probably accidental since the infections produced by other pieces of the same root on tobacco and *N. sylvestris* were fully systemic. Thirty passages in growing isolated root tips had thus apparently not impaired the virulence of the infective principle. Similar results were obtained with aucuba mosaic after 25 passages. Both viruses are being maintained in further subcultures.

The roots infected with the tobacco and aucuba mosaic viruses showed absolutely no external symptoms of disease, and it was further shown experimentally that the virus does not escape from the infected tissues into the medium, nor is it easily transferable to healthy roots by contact with diseased ones or with virus-containing media.

The possible applicability of this method of cultivation to some well-known animal viruses is briefly discussed.

KARATCHEVSKY (I. K.). Био-химическое исследование столбурного заболевания Томатов. [Biochemical studies of the 'stolbur' disease of the Tomato.]—ex *Вирусные болезни растений в Крыму и на Украине* [*Virus diseases of plants in the Crimea and the Ukraine*], pp. 74–78, Госуд. Издат. Крым [State Publ. Office for the Crimea], Simferopol, 1934. [German summary.]

The results of the experiments briefly described in this paper showed that the total content of tomato plants affected with 'stolbur' (local popular name for the 'fruit woodiness' disease) [*R.A.M.*, xiii, p. 133, and next abstract] in carbohydrates (particularly in reducing sugars and starch) is considerably lessened as compared with that of healthy plants, the reverse being true of the total nitrogen content. In the light of Dunlap's attempt to classify virus diseases according to the C/N ratio in the affected host plants [*R.A.M.*, ix, p. 667], these results would appear to support the view of the Russian workers that tomato 'fruit woodiness' belongs to the 'yellows' group of virus diseases rather than to the true mosaic group.

MIKHAILOVA (Mme P. V.). Анатомия одеревенения плодов у Помидора. [Anatomy of Tomato plants affected with fruit woodiness.]—ex *Вирусные болезни растений в Крыму и на Украине* [*Virus diseases of plants in the Crimea and the Ukraine*], pp. 79–92, 10 figs., Госуд. Издат. Крым [State Publ. Office for the Crimea], Simferopol, 1934. [German summary.]

A full account is given of the author's comparative studies of the anatomy of healthy tomato plants and of plants affected with 'fruit woodiness' [see preceding abstract]. The results showed that under the influence of the disease the vascular system of all the above-ground organs and tissues of the plant is accelerated in its development and is hypertrophied, as are also the green parts of the plant, though the fruits are atrophied. The investigation also showed that all the vegetative organs, except the leaf blades, are gorged with starch grains, and that the sieve-tubes of the much hypertrophied phloem in the stems, and more especially in the flower and fruit stalks, are filled with a light yellow substance of a nature as yet undetermined, which in all probability impedes the regular translocation of carbohydrates. The leaf-trace bundles from the calyx lobes are more prominent than normally so that the flower stalk becomes polystelic, while the segment between the calyx and corolla is lengthened and also polystelic. In the petals a palisade layer, absent from the normal ones, is often found. The structure of the mesophyll in the diseased leaves is characteristic of virus diseases, being almost entirely deprived of intercellular spaces and with a reduced differentiation of the palisade tissue. In the fruits, the fibro-vascular bundles become woody and may be felt from the outside; the annular and spiral vessels are transformed into pitted ones, and there is an abundant formation of libriform cells, which are almost entirely absent in healthy tomato fruits.

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PITTMAN (H. A.). **Virus diseases of plants. With particular reference to the spotted or bronzy wilt disease of Tomatoes.**—*Journ. Dept. Agric. Western Australia*, Ser. 2, xi, 1, pp. 123–140, 13 figs., 1934.

After a general survey of the virus disease problem in the light of current investigations [*R.A.M.*, xiii, p. 717], the writer gives an account of spotted wilt of tomatoes which is stated to be responsible for heavy annual losses in Western Australia and other parts of the Commonwealth [ibid., xi, p. 549; xiv, p. 107]. Owing to absence of insect-proof glasshouses in Western Australia, experimental evidence of the presence of the spotted wilt virus is unobtainable, but its occurrence in a severe form is symptomatically indicated on dahlias, Iceland poppies [*Papaver nudicaule*], asters [*Callistephus chinensis*], *Calliopsis* [*Coreopsis*] *drummondi*, nasturtiums [*Tropaeolum majus*], *Ranunculus*, *Anemone*, and perennial scabious [*Scabiosa* sp.], while milder injuries are sustained by *Petunia*, *Cosmos*, English marigolds [*Calendula officinalis*], and columbines [*Aquilegia vulgaris*].

On these plants the symptoms of spotted wilt do not very closely resemble those on tomato, with the result that diagnosis is not always easy. Common features of the disorder are a 'clearing' of the green colour along or adjoining the veins, a faint bronzy or brassy hue on the upper leaf surfaces, death and necrosis of petiole tissue, and the formation of dead, sunken patches on the peduncles. Iceland poppies, *Anemone*, and *Ranunculus* are either rapidly destroyed or may linger without producing any more normal flowers. Young dahlia leaves are often reduced to little more than midribs, while whitish hieroglyphs or irregularly concentric circles may appear on older foliage [ibid., xiii, p. 517]; the flower buds are blackened and seedlings may be killed off in hundreds shortly after transplanting to the flower beds. Dahlias raised from tubers are less seriously damaged than seedlings, especially in loam soils. A very marked tendency to shrivel in hot, drying winds is shown by the basal leaves of diseased dahlias, varieties of which with pale or white flowers seem to suffer more severely than red or dark-coloured ones.

In connexion with recommendations for the control of tomato spotted wilt, it is mentioned that a Balcatta variety known as Arbuckle's or Richter's is somewhat resistant, as also is Early Dwarf Red; Dwarf Champion, on the other hand, is highly susceptible.

In 1931, and again in 1933, some 35 per cent. of the tobacco plants

in an experimental plot at the Government nursery, Perth, were wiped out by spotted wilt, presumably conveyed by insects from the annual flower beds on the other side of a wire netting.

RYJKOFF (V. L.) & KARATCHEVSKY (I. K.). Вирусные бодезни Помидора в опытах по искусственному заражению. [Experiments on the artificial transmission of virus diseases of the Tomato.] —ex *Вирусные болезни растений в Крыму и на Украине* [*Virus diseases of plants in the Crimea and the Ukraine*], pp. 7–30, 6 figs., Госуд. Издат. Крым [State Publ. Office for the Crimea], Simferopol, 1934. [German summary.]

After a brief enumeration of the virus diseases of tomato which have been hitherto described in literature, the authors give a succinct account of the 'woody fruit' ('stolbur') disease of the crop [*R.A.M.*, xiv, p. 128, and next abstracts], which is stated to be extremely widespread as a cause of serious losses in the Crimea, and to have been also observed in the Ukraine, where its exact distribution has not yet been determined. The first outward symptom of the disease is a marked lightening in the normal green colour of young shoots, the leaves on which are somewhat retarded in their growth; when expanded, these leaves are very light green and more or less normal in width but considerably shorter than healthy ones, a feature which sharply distinguishes this disease from that caused in tomato by the cucurbit mosaic virus [ibid., xiii, p. 809; xiv, p. 6], in which the diseased leaves preserve their normal length but are much reduced in width. As in most other virus diseases, old stems and flower trusses fully developed before infection are not affected by the 'woody fruit' virus; trusses in course of development at the time of infection produce fruit exhibiting various abnormalities, among which woodiness of tissues and tastelessness are economically the most important. The virus was not found to be transmissible by needle inoculations, and evidence suggests that insects, possibly the leafhopper *Agallia sinuata*, are responsible for its spread in the field.

The remainder of the paper is given to a description and discussion of inoculation experiments [an account of which has already been noticed from another source: ibid., xiii, p. 808], the results of which indicated, in addition to the information previously given, that tomato mosaic and fern-leaf in the Crimea are caused by the same virus, namely, Johnson's No 1 tobacco mosaic, which is very widespread there and was also extracted from the juice of diseased chilli plants [*Capsicum annuum*]. This indicates the danger of growing tomatoes in close proximity to tobacco plantations. The experiments also supported Johnson's suggestion of the identity of true rugose mosaic with spot necrosis of the potato [ibid., viii, p. 592].

RYJKOFF (V. L.). Фильтрующийся вирус, как причина позеленения цветов. [Filterable virus as a cause of virescence of flowers.]—ex *Вирусные болезни растений в Крыму и на Украине* [*Virus diseases of plants in the Crimea and the Ukraine*], pp. 59–73, 9 figs., Госуд. Издат. Крым [State Publ. Office for the Crimea], Simferopol, 1934. [German summary.]

A detailed account is given of the teratological changes which were

observed by the author in tomato flowers naturally or experimentally infected with 'fruit woodiness' virus [see preceding and next abstracts]. These changes agree closely with those described by Samuel, Bald, and Eardley in the flowers of big bud tomato plants in Australia [*R.A.M.*, xiii, p. 62], and the Crimean disease is considered to be identical with big bud; they also agree with those described by Kostoff in the flowers of tomato shoots grafted on tobacco plants affected with the virus disease causing sterility of this host [ibid., xii, p. 599].

In the Crimea, virescence of tobacco flowers is widely and commonly observed at the same time that 'fruit woodiness' appears in neighbouring tomato plantations, and the morphological changes found in such flowers [a full description of which is given] are entirely analogous with those of virescent tomato flowers. This fact, taken in conjunction with the results of Kostoff's work, is believed to indicate the common origin of the two conditions. Closely similar conditions were also observed in the field on a number of other plants, e.g., bindweed [*Convolvulus arvensis*] (a very common weed in the local tomato and tobacco fields), belladonna [*Atropa belladonna*], *Datura* spp., and many other species of Solanaceae.

KARATCHEVSKY (I. K.). Вирусные болезни Томата в Крыму. (Год полевых наблюдений и опытов.) [Virus diseases of Tomatoes in the Crimea. (A year of field observations and experiments.)]—ex *Вирусные болезни растений в Крыму и на Украине* [*Virus diseases of plants in the Crimea and the Ukraine*], pp. 39–58, 2 diags., Госуд. Издат. Крым [State Publ. Office for the Crimea], Simferopol, 1934. [German summary.]

As a result of his investigations in 1932 of tomato crops in the open and under glass in several districts of the Crimea, the author established the existence there, besides the 'fruit woodiness' and tobacco mosaic (fern-leaf) virus diseases of the crop [see preceding and next abstracts], of a chlorosis characterized by a canary-yellow discoloration extending upwards from the petioles on to the leaf blades, which first appears towards the end of June, and the symptoms of which become masked on the onset of hot weather at the end of July to reappear with the return of cooler weather. The trouble was not studied more closely, although in one plantation it was abundant. Three further pathological conditions of tomatoes were also noted, namely, a yellowing of the foliage, a stunting of the leaves, and a wrinkling of the leaf surfaces accompanied by necrotic spots; while the nature of these conditions has not yet been determined, their macroscopic symptoms suggest that they are caused by viruses. All three were found only occasionally in the field.

On tomatoes in the field the tobacco mosaic (fern-leaf) disease first appeared on 18th June, ten to twelve days after transplantation of the seedlings from cold beds under glass. This indicates, since it was shown that at that season the incubation period of the disease lasts from 7 to 12 days, that infection occurred immediately on transplantation or even earlier, as tests proved that this mosaic develops at the lowest temperatures permitting growth of the host. The disease spread in the fields during the whole vegetative period, gradually slowing down as the

season advanced, but it remained confined to more or less well-defined patches, each around an infection focus, irregularly distributed in the field. The 'fruit woodiness' disease, on the other hand, appeared that year, as well as in the three preceding years, very late (about the last ten days of July) and spread at first very rapidly and regularly over the whole tomato plantations; from the second half of August onwards, however, the spread gradually slowed down and ceased, although individual new infections could sometimes be found as late as October. Not infrequently both diseases were found on the same plant, the frequency of such mixed infections being directly related with the intensity of the two diseases.

For lack of adequate information, the mosaic has been hitherto ignored by the local tomato growers, who attributed the lesions and losses caused by it to other diseases or to defective cultivation; the author, however, found it in most of the tomato-growing districts of the Crimea, with an average percentage incidence of 2·4. Special tests, the results of which were checked by statistical methods, showed that on the average the yield of mosaic tomato plants was reduced to 0·54 kg. from 1·24 kg. in the controls. Similar tests for 'fruit woodiness', which is very extensively distributed in the whole peninsula, showed that the yield in utilizable fruit of the diseased plants is reduced to about 30 per cent. of that of the controls.

A study of the weeds most commonly found in tomato fields showed that a number of them exhibited mosaic-like symptoms, but attempts to transmit the disease from them to tomatoes gave positive results only in the case of henbane [*Hyoscyamus niger*]. Among the numerous insects observed to feed on the plants, *Aphis fabae* [*A. rumicis*] and a species of *Pergandeida* alone were shown in preliminary tests to be able to transmit mosaic though they failed to transmit 'fruit woodiness', the insect vector of which was not determined.

In dealing with control measures [which are discussed in some detail] an account is given of experiments to investigate a possible correlation between the density of weeds and spread of the two diseases, the results of which showed that although dense and tall weeds apparently prevent dissemination, presumably by creating an uncongenial environment for the insect vectors [cf. *R.A.M.*, x, p. 414], careful weeding of tomato plots at frequent intervals, especially early in the season, may contribute to the control of infection.

Soukhoff (K. S.). Материалы к физико-химической характеристике ультравируса мозаикн. [Contribution to the physico-chemical characterization of the filterable viruses of mosaic.]—ex *Вирусные болезни растений в Крыму и на Украине* [*Virus diseases of plants in the Crimea and the Ukraine*], pp. 31–38, Госуд. Издат. Крым [State Publ. Office for the Crimea], Simferopol, 1934. [German summary.]

The results of the experiments briefly described in this paper showed that the virus of the Crimean tomato fern-leaf disease [see preceding abstract] passes through a Chamberland filter without any noticeable loss of virulence, and that it is not inactivated, especially at temperatures between 0° and 5° C., by the addition to it of an equal volume of

acetone or 96° ethyl alcohol. These properties of the virus indicate that it belongs to the group of tobacco mosaics and is not related, as suggested by Mogendorff [*R.A.M.*, ix, p. 418] to cucumber mosaic. It was further shown that the fern-leaf virus is not destroyed by pepsin either in the crude filtrate or in the deposit formed after precipitation with acetone.

Referring briefly to the recent discovery of the widespread existence in nature of the so-called 'mitogenetic radiation' emanating from organic substances, e.g., haemolysed blood, the action of which is to accelerate budding or division in unicellular organisms (yeasts, bacteria, and the like), and of which the latter are also an abundant source [cf. ibid., viii, p. 555], the author tested for its presence the virus of tomato streak and that of tomato 'fruit woodiness', in the attempt to determine whether these viruses are living organisms or not. For this purpose agar cultures of a yeast [unnamed] were exposed for 25 minutes to the action of small masses of crushed tissues obtained from tomato plants affected with streak, 'fruit woodiness', and fern-leaf, and from tobacco plants inoculated with the tomato fern-leaf virus [no control tests with crushed tissue of healthy plants are mentioned], after which the cultures were kept for one hour in a moist chamber. Of all the tissues tested, the tomato streak tissues alone gave an indication in the first series of tests of having exerted a mitogenetic action on the yeast, while later in the season no action at all was noticed. The possibility is admitted that the mitogenetic radiation recorded in the first series may have been induced by the necrotic processes brought about by autolysis of the crushed tissues, which has been stated in literature to be a frequent source of the radiation.

ARNAUD (G.). **Le dépérissement de l'Orme (Graphium ulmi).** [The dying-off of Elms (*Graphium ulmi*).]—*Prog. Agric. et Vitic.*, cii, 36, pp. 260–265, 4 figs., 1934.

A brief popular account is given of the Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) [*R.A.M.*, xiv, p. 63], and of its geographical distribution, as well as a short list of European and Asiatic species of *Ulmus* which have been so far reported as offering a certain degree of resistance to the disease.

GOIDÀNICH (A.) & GOIDÀNICH (G.). **Lo Scolytus sulcifrons Rey (Coleoptera-Scolytidae) nella diffusione del Pirenomicete Ceratostomella (Graphium) ulmi (Schwarz) Buis. nell'Emilia.** [*Scolytus sulcifrons* Rey (Coleoptera-Scolytidae) in the dissemination of the Pyrenomycete *Ceratostomella* (*Graphium*) *ulmi* (Schwarz) Buis. in Emilia.]—*Boll. Lab. Entomol. R. Ist. Sup. Agrario di Bologna*, vii, pp. 145–163, 5 pl., 2 figs., 1934.

A study [which is fully described] of the life-cycles of *Ceratostomella ulmi* and of the bark beetles *Scolytus sulcifrons* Rey and *S. multistriatus* (the former of which is one of the principal disseminators of the fungus in Italy) with particular reference to elm die-back in Bologna [*R.A.M.*, xii, p. 734; xiii, p. 481] demonstrated that the fungus readily fructifies in the galleries made by the insects, and that its chief means of ingress to the tree lies in the food galleries bored by them in the young branches.

The insects are also indirect agents of spread, since by making their breeding galleries in contact with diseased wood they enable the fungus to invade the gnawed débris, in which it finds conditions so favourable that it is able to form coremia, sporulation thus being much more abundant than would otherwise be the case.

As direct control by spraying with fungicides or insecticides appears to be impracticable, the authors recommend that all dead and diseased trees should be barked and also that trunks and portions of thick branches should be placed near the elms it is desired to protect to serve as bait to attract the female insects in search of places to deposit their eggs, the operation being carried out on a very large scale under proper entomological supervision. All infected material should be destroyed.

Under the conditions prevailing in Italy elm die-back usually proves rapidly fatal.

BURGES (A.). **Studies in the genus Uromycladium (Uredineae). I. General introduction, the anatomy of the galls, and the cytology of the vegetative mycelium and pycnia of Uromycladium tepperianum (Sacc.) McAlp. on Acacia stricta Willd.**—*Proc. Linn. Soc. New South Wales*, lix, 3–4, pp. 212–228, 24 figs., 1934.

The author states that the Australian genus of gall-forming rusts, *Uromycladium* [*R.A.M.*, iii, p. 369], is composed, so far as is known at present, of microcyclic species. The galls [the structure of which is described in detail] formed by *U. tepperianum* on *Acacia stricta* are usually annual, but may be perennial, and are mainly composed of unlignified xylem tissue, the fungus probably utilizing the material which would normally produce lignification. The vegetative mycelium is confined to the seat of infection and is characterized by uninucleate cells. Infection usually occurs before cork formation has begun and the first tissue to react is usually the phloem, the cells of which enlarge and become meristematic in small patches. The hyperplasia deforms and ruptures the outer tissues at about the same time that the cambium and xylem become involved. Haustoria are abundant in the phloem tissues at this stage. The identity of the cambium is lost at an early stage, but the xylem rows remain evident, though unlignified, for some time. Ultimately the irregular division of the active cells caused distortion, and new tracheids may form from any of the tissues involved in the gall. The paper terminates with a full account of the cytology of the pycnidia of *U. tepperianum*.

BITTMANN. **Wucherungen an der Schwarzpappel.** [Outgrowths on the Black Poplar.]—*Wiener Allgem. Forst- und Jagdzeit.*, lii, p. 50, 1933. [Abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvii, 6, p. 146, 1934.]

Aspens [*Populus tremula*] and black and silver poplars [*P. nigra* and *P. alba*] in the Danube and other Austrian river valleys are stated to be liable to infection by *Diplodia gongrogena* Temme, which causes the development of cortical excrescences. The fungus enters the host not only through wounds but also by way of the lenticels. Canadian and Lombardy poplars [*P. canadensis* and *P. pyramidalis*] were never observed to be affected. A similar condition on willows [*Salix*] is pro-

duced by *Pestalozzia gongrogena* Temme, which causes cortical swellings that frequently girdle the branches.

Boyd (E. Sophia). **A developmental study of a new species of Ophiodothella.**—*Mycologia*, xxvi, 5, pp. 456–468, 1 pl., 2 figs., 1934.

Latin and English diagnoses are given of *Ophiodothella vaccinii* n.sp., a parasite of *Vaccinium arboreum* in the south-eastern United States, which has frequently been determined in herbaria as *Rhytisma vaccinii* (Sw.) Fries. The small, yellow spots on the leaves representing the initial stages of infection by the extensively branched mycelium appear about midsummer, followed towards the end of September by the development of a perfect stage, with perithecia, averaging 336 μ in diameter and 168 μ in height, in the mesophyll. On morphological grounds [which are indicated] the genus *Ophiodothella* is transferred from the family Phyllachoraceae of the Dothideales to Clypeosphaeriaceae of the Sphaeriales.

Lachmund (H. G.). **Damage to Pinus monticola by Cronartium ribicola at Garibaldi, British Columbia.**—*Journ. Agric. Res.*, xlix, 3, pp. 239–249, 1 diag., 2 graphs, 1934.

The observations reported in this paper were started in 1922 at Garibaldi (formerly Daisy Lake), British Columbia, where blister rust (*Cronartium ribicola*) is stated to be very destructive to the western white pine (*Pinus monticola*) [*R.A.M.*, xiii, p. 814], for the purpose of following the damage done by the fungus from year to year. Of the three plots of pine studied, the first was demarcated in the midst of a dense growth of the susceptible *Ribes bracteosum* and *R. lacustre* [ibid., xiv, p. 66], the second on the border of this area, and the third was delimited in 1923 about 300 yards to the north-east, where there were only a few *Ribes* within 30 yards. In plot 1 about 40 per cent. of the trees had been killed by the rust by 1922, and 90 per cent. were dead by 1924; only one (out of 178 trees) remained alive in 1931. On plot 2, although over 90 per cent. of the trees were infected in 1922, none had been killed by that date, but about 66 per cent. had succumbed by the autumn of 1931, and it was estimated that the remainder would not survive more than a few years. On plot 3, only 40 per cent. of the trees were infected in 1923 with none dead, and the infection increased to 86 per cent. in 1931, when 11 per cent. were found to have died. The intensity of the infection in plots 1 and 2 in 1922 is indicated by the fact that on some of the larger and more heavily infected trees up to 1,800 cankers were found in plot 1 and 5,000 in plot 2. When compared with these figures, the relatively light incidence of the rust in plot 3 is considered to demonstrate the close relation of the intensity of pine infection to the distance from the source of sporidia on *Ribes*, most of the infection in this plot certainly originating from the few scattered neighbouring *R. lacustre* and *R. sanguineum* plants.

Special observations showed that some killing-back occurred in the new growth produced by the *Ribes* plants during the period in which the infected pines immediately associated with them remained alive and produced aecidiospores; normal growth was, however, resumed by these plants after the death of the pines.

DENNIS (R. W. G.). **A new species of Pestalotia on Podocarpus.**—*Phytopath.*, xxiv, 9, pp. 1026–1028, 1 fig., 1934.

The leaves of *Podocarpus elongata* in the Glasgow Botanic Gardens were observed in 1932 to be affected by a purplish-brown spotting, the areas involved tending to become greyish or silvery, and being surrounded by a well-marked brown line of demarcation from the healthy parts of the leaf. The fungus isolated from the diseased tissues on 2 per cent. malt agar was identified by Prof. E. F. Guba as a species of *Pestalotia* [*Pestalozzia*] to which the name of *P. podocarpi* n.sp. is assigned [with Latin and English diagnoses]. The same fungus is stated to be preserved in the herbarium of the Berlin Botanical Museum under the name of *P. funerea* Desm. [*R.A.M.*, viii, p. 605; xii, p. 332] *P. podocarpi* Sacc., nom. nud. The fungus has thick-walled, brown hyphae, and 4-septate, narrowly fusoid, straight or slightly curved conidia, tapering at both ends, 17·5 to 24·5 μ in length. The three median conidial cells are olivaceous or the upper two darker, 12 to 17·5 by 4·4 to 7 μ, the terminal ones conical, with three (or more rarely two) setae and a short pedicel.

ROBERTSON (W. A.). **Report of the Director of Forest Products Research for the year 1933.**—*Rept. Forest Products Res. Board for the year 1933*, pp. 4–58, 3 pl., 1 map, 1 graph, 1934.

In 1933, owing to the hot, dry summer the progress of dry rot (*Merulius lacrymans*) in the experimentally constructed house at the Forest Products Research Laboratory, Princes Risborough [*R.A.M.*, xiii, p. 196] was checked, but renewed activity was observed in November. Western red cedar [*Thuja plicata*] boards still showed no infection after being in contact with active dry rot for over twenty months in a hollow, unventilated floor where the moisture content of the wood reached 40 to 45 per cent. of the dry weight. Extensive rotting occurred in boards nailed to battens lying on or embedded in concrete and covered with impervious material, mostly due to *Coniophora cerebella* [*C. puteana*: ibid., xiii, pp. 70, 284], which appeared naturally, supplanting the originally introduced *M. lacrymans*, for which the conditions had become too moist. Excepting spread from adjoining decayed floors no decay took place in boards laid directly on a layer of bitumen above the concrete, although these were also under an impervious covering; the moisture content of the boards averaged 16 to 20 per cent., whereas in floors laid direct on the concrete up to 41 per cent. moisture was sometimes present. The 'well-constructed', suspended, ventilated floor developed no trace of rot, although for a third time each section was infected with a piece of wood containing *M. lacrymans* in active growth; the average moisture content of the timber was about 18·5 per cent., i.e., under the minimum requisite for the growth of this fungus.

Serious decay in the oak timbers of buildings was on several occasions due to a fungus provisionally identified as *Fomes cryptarum* [ibid., xii, p. 669].

Cultures from so-called 'brown' oak all gave the same fungus, and the condition is regarded as a very early stage of decay before the wood weakens or disintegrates. The fungus is unable to continue growth

after the tree is felled. A similar condition, associated with the same fungus, was observed in *Castanea sativa.*

The cause of a vivid, purplish-violet, rapidly spreading discoloration in white lead paints under moist conditions was determined as *Phoma pigmentivora* [cf. ibid., i, p. 276].

Decay fungi isolated from discoloured and rotted wood pulp included *Lenzites sepiaria*, *Lentinus lepideus* [ibid., xiii, pp. 70, 137], and *Peniophora gigantea*; the staining was mostly due to *Trichoderma lignorum* [ibid., xiii, p. 484].

Notes are given on the progress of laboratory tests of timber preservatives, the identification and physiology of wood-destroying fungi [ibid., xiii, p. 196], the chemistry of decay, and the fungal staining of timber.

McCrea (Adelia). **Longevity of Merulius lacrymans in wood destroyed by its growth.**—*Mycologia*, xxvi, 5, pp. 454–455, 1934.

In 1930 viable cultures of *Merulius lacrymans* were still obtainable both from the wood and the cloth upholstery of a car, the wood of which had crumbled owing to infection by the fungus, in a minor collision in 1928 after four or five years' use. Subsequent attempts have been positive only for the wood, the sporophore which had formed on the cloth apparently being dead. Assuming the fungus to have been present in the wood when the car was built, viability must have been maintained for ten to eleven years in the vegetative state as against two to three in the sporophore. Under the same unfavourable conditions, therefore, life persists considerably longer in the wood than in the fruit body. These facts are in conformity with Findlay's statement that difficulty in inducing germination in *M. lacrymans* spores is due to the use of spores that are no longer fresh [*R.A.M.*, xii, p. 607].

Eckersley (Audrey M.). **Some sap-staining organisms of Pinus radiata, D. Don, in Victoria, Australia.**—*Proc. Roy. Soc. Victoria*, (N.S.), xlvi, 2, pp. 179–194, 21 figs., 1 graph, 1934.

Three fungi have been isolated in Victoria from sap-stained *Pinus insignis* (*P. radiata*) boards and fruit-case timber, viz., *Hormonema dematioides* and *Ceratostomella* forms A and B [*R.A.M.*, xiii, p. 341], the first-named causing a neutral grey to green-black streaking and the others a greyish-blue discoloration of the surface. Pure cultures of the organisms reproduced the stains on clean *P. insignis* sapwood containing 100 per cent. of its oven-dry weight of moisture. A full description is given of the cultural characters and morphology of the three fungi and of their histological effects on the wood. A comparison with *C. pilifera* (Fr.) Wint. and *C. coerulea* Münch obtained from Baarn showed that all constitute a connected series, the two new forms being intermediate between the others. It is concluded that all four strains belong to the one fungus, which on grounds of priority should be known as *C. coerulea.*

Leach (J. G.), Orr (L. W.), & Christensen (C.). **The interrelationships of bark beetles and blue-staining fungi in felled Norway Pine timber.** —*Journ. Agric. Res.*, xlix, 4, pp. 315–341, 12 figs., 1 graph, 1934.

The results of field experiments since 1931 at Arago, Minnesota (some

of which were made under partly controlled conditions) showed that blue-staining fungi are introduced into felled Norway pine (*Pinus resinosa*) logs by the two bark beetles *Ips pini* and *I. grandicollis* [cf. *R.A.M.*, xiv, p. 68], and hardly ever by any other means. Only two species of blue-stain fungi were found to be associated with these beetles, namely, *Ceratostomella ips*, which is stated to be the most prevalent, and a species which apparently has not been described hitherto and which is named *Tuberculariella ips*, with a Latin diagnosis. It is characterized by hyaline, globose to piriform conidia, 13·3 to 23·8 by 7·9 to 22·5 μ, borne singly and successively at the ends of unbranched, septate conidiophores; the sporodochia are white and waxy but not mucilaginous. On agar, the fungus forms at first hyaline colonies, later changing to black, with a scant grey aerial mycelium.

Some of the isolations from stained wood and from the beetles yielded only a *Graphium* identical with the conidial stage of *C. ips*. Six out of 15 single ascospore cultures of *C. ips* also formed only conidia and failed to give perithecia when paired together in all possible combinations. Inside the logs, the fungus forms perithecia more commonly than conidia, but typical *Graphium* coremia were often found in the old egg channels or pupal chambers. The perithecial beaks point towards the centre of the channels, and when moisture conditions are favourable the spores ooze from the tips in sticky masses, this ensuring their adherence to the body of the newly hatched beetles as they emerge from the pupal chambers. It was shown that the beetles eat the ascospores and even parts of the perithecia, and that the spores retain their viability after passage through the intestinal tract.

In addition to the blue-staining fungi, characteristic yeasts were also constantly associated with the beetles. The latter were further shown frequently to introduce into the logs mites, which were also found to carry yeast cells and spores of the fungi on their bodies, thus contributing to the distribution of these organisms inside the logs.

KAMESAM (S.). **A record of the results obtained with experimental treated sleepers laid in the Indian railways between 1911 and 1916.** —*Forest Res. Inst., Dehra Dun, Forest Bull.* 85, 35 pp., 1934.

A detailed, fully tabulated account is given of the results of experiments carried out from 1911–16 in the preservation of Indian railway sleepers [cf. *R.A.M.*, xiii, p. 284].

Powellizing with a solution of white arsenic and molasses has given excellent results, especially in dry areas, while impregnation with a high-boiling creosote or carbolineum, diluted with a suitable oil medium, was also promising, but zinc chloride was less satisfactory.

The author states that the Indian railway companies have a high opinion of the creosote-crude oil treatment, which has in fact become standardized during the last decade. In view, however, of the very high cost of this material (over twice as much in India as in England), it may be well to consider the possibility of arsenic (preferably mixed with copper to ensure a high degree of fixation), a far cheaper but apparently equally efficacious treatment, which is stated to be widely used in South Africa and Australia.

Williams (R. R.). **Chemical studies of wood preservation. I. The problem and plan of attack.**—*Indus. & Engin. Chem.* (*Analyt. Ed.*), vi, 5, pp. 308–310, 1934.

The chemical problems involved in wood preservation are discussed with special reference to southern pine [*Pinus palustris*] telephone poles treated by pressure with creosote oil. The principal cause of loss of preservative value in creosote oil is evaporation, and in order to gauge the extent of this process an evaporimeter has been developed for measuring the rate of evaporation of an oily preservative under conditions simulating those obtaining in nature. The instrument further supplies material for the estimation of residual toxicity at various stages of evaporation.

Waterman (R. E.), Wells (C. O.), & Peek (R. L.). **Chemical studies of wood preservation. II. Sampling poles for chemical analysis.**—*Indus. & Engin. Chem.* (*Analyt. Ed.*), vi, 5, pp. 310–314, 4 figs., 2 diags., 1 graph, 1934.

In the course of protracted studies of the quantitative and qualitative changes in creosote oil preservatives in southern pine [*Pinus palustris*] poles [see preceding abstract], it has become evident that the analysis of samples indiscriminately taken from timbers may lead to gross errors. A true sample of a round timber must contain a volume of each annual growth ring proportional to its distance from the centre of the tree and must further represent each sector of cross section of the timber. The desired result may be approximated by taking increment borer cores round the circumference of the timber and bisecting each core in such a way that the segments removed for analysis are similar to wedges in their significant geometrical features. The application of this method of sampling is illustrated by means of equations.

Rudge (E. A.). **An inquiry into the mechanism of decay of wood.**—*Journ. Soc. Chem. Ind.*, liii, 36, pp. 282T–287T, 1 graph, 1934.

In continuation of his work on the chemical decay of timber [*R.A.M.*, xiii, p. 816], the author suggests that certain compounds, notably the bicarbonates, react with cellulose by a mechanism assumed to be similar to that of the thiocarbonates in the chemistry of viscose silk, and the inference is drawn that decay through the agency of the bicarbonates follows a repeated cycle of reactions under alternately wet and dry conditions. Methods of timber preservation depending solely on antiseptic action are inadequate to protect the wood against chemical disintegration, which may, however, be indefinitely arrested by preventing the completion of the above-mentioned cycle of changes. Thus, continuous immersion in water will prevent the oxidation process even in the presence of high concentrations of bicarbonates, while the formation of bicarbonate complexes is suppressed by the maintenance of a dry condition. It is significant that the factors governing ionic disintegration and fungal development are identical. The author has been able to induce rotting in spruce, *Liriodendron* [*tulipifera*], and oak by ionic infiltration under aseptic conditions.

Robak (H.). **Om sopp i tremasse og følgene av det såkaldte 'lukkede' system.** [Mould in pulp and the consequences of the so-called 'closed' system.]—*Papir-Journ.*, Oslo, xxii, 4, pp. 42–45; 5, pp. 51–54, 1934.

Wood pulp is stated to be always infected by moulds when it leaves the pulping machine, the sources of contamination being the wood, water, and air. Warm-ground pulp is practically sterile when it leaves the stones, so that in this system the wood plays a negligible part as a carrier of infection. However, the spore count of the water may be sufficiently high to explain the heaviest infection, e.g., by blue-staining fungi [*Ceratostomella* spp., *Cadophora fastigiata*, *Lecythophora lignicola*, *Trichosporium heteromorphum*, &c.: *R.A.M.*, xii, p. 69; xiv, p. 69], the spores of which, according to Melin's unpublished researches in Sweden, may number 3,000 per c.c. Air has been found relatively unimportant as a source of infection compared with water, especially where the 'closed' grinding system is employed. The risks of infection may be effectively eliminated by a closed and covered system, keeping the temperature above 50° C., filtering the fresh water through sand filters, and sterilizing it with a chlorine compound.

Fajardo (T. G.) & Palo (M. A.). **A serious leaf spot of Chinese Celery Cabbage, Wongbok, and other cruciferous plants in Trinidad Valley, Mountain Province, Luzon.**—*Philipp. Journ. of Agric.*, v, 3, pp. 143–156, 4 pl., 1934.

A grey leaf spot of Chinese celery cabbage (*Brassica pekinensis*) and other crucifers, identical with that described by Weimer as due to *Alternaria herculea* [*A. brassicae*: *R.A.M.*, vi, p. 202; xiii, p. 3], has been observed in Mountain Province, Luzon, Philippine Islands, causing up to 100 per cent. infection in the field and severely damaging the plants. The colour and size of the spots vary according to the host from pale grey to dark brown and from 0·5 to 12 mm. Spontaneous infection has been found on *B. chinensis*, mustard, turnip, radish, cabbage, and broccoli in addition to *B. pekinensis* in the Trinidad Valley and environs of Baguio, the fungus being most virulent during the cool, moist season but apparently remaining active to some extent throughout the year. Slight morphological and cultural differences were detected between the strains of *A. herculea* from the various hosts, but these are not considered to justify specific distinction. Besides the usual cultural measures of control, including prolonged crop rotation and the use of healthy seed, spraying with 2–2–50 or 3–3–50 Bordeaux mixture is recommended.

Reid (W. D.). **Production of wilt-free Beans.**—*New Zealand Journ. of Agric.*, xlix, 3, pp. 164–169, 3 figs., 1934.

Although no suitable seed treatment has yet been devised in New Zealand against bacterial wilt [*Bacterium medicaginis*: *R.A.M.*, xi, p. 418] of beans, clean seed has now been obtained by selection.

In trial plots laid down in October, 1931, the disease was confined to Canadian Wonder lines and one line of butter beans [*Phaseolus vulgaris*], the Epicure, Zebra runner and scarlet runner [*P. multiflorus*] varieties remaining unaffected, though in an earlier test the last-named had been susceptible.

At first, most of the affected plants were adjacent to points of primary infection, and the amount of disease present was governed mainly by the number of seedling infections. The disease slowly progressed from these centres, generally along the drills, but when the plants were closely set it spread over a circle two to three feet in diameter in seven to ten days. A space of at least two chains was necessary to prevent spread. When all the plants were rogued out within two or three feet from a diseased plant the recurrence of the disease was reduced. More thorough roguing later provided many disease-free lines.

Next season, fifteen of these clean lines were sown in three localities, one being remote from other cultivated land, while in the others the plots were close either to an infected control crop or to market gardens; no disease appeared in the first district, but in the other two, five out of eleven plots became affected. Three of the infected crops were the progeny of crops that had remained healthy the previous season. Finally, two plots had remained clean, and five appeared to be clean after roguing.

In 1933–4, plots on farms in six localities were sown with seed from the previous test crops, three of which had been infected and rogued in 1932–3, one infected and rogued in 1931–2, but uninfected the following year, while two had remained throughout clean. All the plots, which ranged from $\frac{1}{8}$ acre to two acres in area, were sown, cultivated, and harvested by the farmers, and all remained free from wilt.

Gäumann (E.). **Zur Kenntnis des Uromyces fabae (Pers.) de By.** [A contribution to the knowledge of *Uromyces fabae* (Pers.) de By.]—*Ann. Mycol.*, xxxii, 5–6, pp. 464–470, 1934.

A new form of *Uromyces fabae* (f. sp. *viciae sepium*) [cf. *R.A.M.*, xiii, p. 670] on *Vicia sepium* in the Zürich district of Switzerland is described. It was shown by cross-inoculation experiments to infect broad beans (*V. faba*) heavily and *V. monantha* [*V. calcarata* Desf.] mildly.

Wimmer (G.) & Lüdecke (H.). **Ist Bormangel die Ursache der Herz- und Trockenfäule der Zuckerrüben?** [Is boron deficiency the cause of the heart and dry rot of Sugar Beets?]—*Zeitschr. Vereins Deutsch. Zuckerind.*, lxxxiv, 9, pp. 627–666, 12 figs., 1934.

The writers' observations and experiments [the results of which are fully discussed and tabulated] on the effects of boron applications on the heart and dry rot of beets [*R.A.M.*, xiv, p. 73] lend no support to the view that the absence of this element from the soil is the cause of the disease. Such beneficial action as it exerts is of a stimulatory and not of a curative nature—a statement applicable also to its alleged improvement of a tomato disorder analogous to heart and dry rot of beets [ibid., xii, p. 3].

Leach (L. D.) & Borthwick (H. A.). **Distribution of downy mildew mycelium in Spinach fruits.**—*Phytopath.*, xxiv, 9, pp. 1021–1025, 1 fig., 1 diag., 1934.

The examination of spinach fruits at the University of California revealed the presence of abundant mycelium of downy mildew (*Perono-*

spora effusa) [*R.A.M.*, xii, p. 417] in the calyx tube, funiculus, integument, and nucellus. The ovule is invaded through the funiculus, whence the mycelium passes into and spreads through the integuments. The nucellus becomes infected by mycelium entering through the chalaza. In a limited number of germination trials no evidence of the transmission of *P. effusa* by the seed was obtained.

Wilson (J. D.). **Celery yellows in Ohio.**—*Ohio Agric. Exper. Stat. Bimonthly Bull.*, 168, pp. 109–115, 2 figs., 1934. [Abs. in *Exper. Stat. Record*, lxxi, 5, pp. 654–655, 1934.]

Celery yellows (*Fusarium* sp.) was found to be prevalent on the susceptible tall strain of Golden Self Blanching at a temperature range of 20° to 32° C. in Ohio [*R.A.M.*, xii, p. 416; xiii, p. 685], the optimum for the fungus being above 28°. Field trials in 1932–3 showed the green variety, Columbia, to be very resistant, as was also Michigan Golden, a selection of the tall strain of Golden Self Blanching. A fair degree of resistance was further manifested by Florida Golden and Golden Prize (intermediate in character between the true green and yellow types) in addition to others previously mentioned.

Baldacci (E.). **La batteriosi del Sedano da Bacillus carotovorus Jones.** [Celery bacteriosis caused by *Bacillus carotovorus* Jones.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, v, pp. 77–119, 10 figs., 1934. [Latin and English summaries.]

Celery in the vicinity of Voghera, northern Italy, has for some years been attacked by a disease which has steadily become worse, until in 1933–4 the loss amounted to over 60 per cent. of the crop. In the field the affected plants occurred in irregular patches or along the rows, and the plots became affected one after another, apparently in relationship with the course of the irrigation water. In practically all the plots celery had been grown without rotation for several years in succession, and there was no obvious influence on the disease of the type of soil.

The leaves and stalks of the affected plants turned prematurely yellow or greenish-yellow, the discoloration rapidly progressing from the inner to the outer leaves. The part covered over by the earthing-up process was flaccid and the heart and crown developed a soft, brownish, later almost black, rot which extended to the roots; the plants were ultimately reduced to a semi-fluid, evil-smelling mass.

In the early stages of the disease yellowish, punctiform, collapsed necrotic areas, outwardly invisible, measuring 2 to 3 mm. in diameter, extended from the point of insertion along the vascular bundles of the leaf stalks. Below the point of insertion there was a softening of the crown tissues which spread inwards, while in the heart softening was mainly in the peripheral tissues.

From affected material the author isolated *Bacillus carotovorus* (*B. apiovorus*) [*R.A.M.*, vii, p. 218; x, p. 79], the cultural, morphological, and biochemical characters of which are described, and inoculations with which reproduced the disease on healthy celery plants. Comparison with four strains of *B. carotovorus* from the National Collection of Type Cultures, London, revealed the general similarity of the symp-

toms produced by all the strains on celery, but the author's strain showed different cultural characters from the others.

From its physiological and cultural characters and the symptoms produced by it on celery, as described in literature, the author considers that *Bacterium apii* (Brizi) Migula is identical with *B. carotovorus*. The cultural characters described by Jagger in *Bact. jaggeri* Stapp [ibid., xiv, p. 16], the causal organism of a celery leaf spot not yet reported from Italy, are quite different from those of all the strains of *B. carotovorus* examined, and the two organisms are considered to be distinct. A table is given showing the cultural characters of the five strains of *B. carotovorus*, *Bact. apii*, and *Bact. jaggeri*.

A bibliography of 58 titles is appended.

UPPAL (B. N.). **The adsorption and elution of Cucumber mosaic virus.**—*Indian Journ. Agric. Sci.*, iv, 4, pp. 656–662, 1934.

An account is given of experiments conducted to ascertain whether the non-filterability of the cucumber mosaic virus [*R.A.M.*, xiii, p. 545] through Pasteur-Chamberland candles indicates a high degree of adsorption of the infective agent on the walls of the pores and on other similar substances. The results obtained [which are tabulated and discussed] showed that the passage of the virus extract through a sand and pulp filter or fuller's earth rendered the filtrate non-infectious to tobacco and cucumber. Adsorption readily occurred when kaolin or fuller's earth was added to the virus extract even in such small quantities as 0·125 gm. per 100 c.c. The virus was inactivated when the P_H value of the medium was less than 5, being active only between (approximately) P_H 5 and 9. Adsorbed to fuller's earth it was freed *in vitro* in an active state by altering the P_H value of the suspension to one between 6 and 6·7; when the medium was more acid than P_H 6, no infection was obtained. When the residue was treated with an ammonia solution the supernatant liquid was non-infectious, but the virus was released in an active stage by changing the P_H value of the suspension to acidity, i.e., to 6 to 6·7. It therefore appears that the adsorption and inactivation of the cucumber mosaic virus are reversible phenomena.

YOSHII (H.). **Pathological studies on Watermelon wilt. III. The pathological anatomy of the diseased seedling. IV. The pathological anatomy of the affected plants.**—*Bull. Sci. Fakultato Terkultura, Kjuŝu Imper. Univ.*, vi, 1, pp. 1–33, 17 figs., 1934. [Japanese, with English summary.]

The examination at Kyushu, Japan, of serial sections of watermelon seedlings planted in soil infested with wilt (*Fusarium niveum*) and removed at the first sign of wilting [*R.A.M.*, xiii, pp. 419, 560], revealed the presence of the mycelium in irregular, often isolated colonies along the vascular bundles, extending at times into the cortical parenchyma and collenchyma. The marked irregularity of the mycelial development along the vascular bundles is considered to be the result of microconidial migration from the lower part of the infected vessel along with the transpiration stream. Some correlation was noticed between the extent of fungal growth along the vascular bundles and the loss of turgidity or necrosis of the surrounding parenchymatous tissues, externally

manifested as wilting. The soft rot observed in certain seedlings was found to be the result of an extension of the fungus from the vessels into the parenchymatous tissues.

Similar studies of mature plants showed that *F. niveum*, entering the host at the tip of the rootlet, rapidly invades the vascular tissue and eventually fills the disintegrated stele with mycelium. The majority of the secondary roots produced by the diseased primary one may become infected before their tips traverse the cortical parenchyma of the mother root. These pathological changes are mostly followed by wilting of the plants as soon as the soil moisture content decreases to a certain point. In some cases, however, even a heavy infection of a limited number of the rootlets does not necessarily lead to a generalized extension of the wilt, possibly owing to the exclusion of the pathogen from the upper healthy roots by premature suberization of the exo- and endodermis and the formation of tyloses within the affected vessels. The cortical parenchyma and the leptome of the main roots and stems of diseased watermelon plants gradually disintegrate and shrivel into brown, flattened forms. The medullary ray, pith parenchyma, and cambial cells first undergo hypertrophy and then disintegration, forming large cavities often occupied by resinous substances. Similar changes generally occur at an earlier stage in the hadrome, but the direct cause of the wilt is not, in the writer's opinion, to be sought in these phenomena. From the vessels behind the invaded root tip the fungus reaches the upper vessels by microconidial migration, and the mycelium arising from these conidia may pass through the pits into the surrounding tissues, causing them to collapse and thus impairing the water-conducting function of the bundle. No suberization takes place round the diseased tissues of mature plants, so that the mycelium is readily able to penetrate the cell walls. The absence of a protective mechanism in older plants, such as is found in seedlings, is attributed mainly to the toxic action on the tissues of one or more substances secreted by the vigorously growing mycelium.

Mitra (M.). **Wilt disease of Crotalaria juncea Linn. (Sann-Hemp).**—*Indian Journ. Agric. Sci.*, iv, 4, pp. 701–714, 1934.

Details are given of experiments from 1932–4, the results of which showed that under the conditions prevailing in Pusa the wilts of sann-hemp (*Crotalaria juncea*) and of pigeon pea (*Cajanus indicus*) are chiefly caused by similar biological strains of *Fusarium vasinfectum* [*R.A.M.*, xii, p. 567], cultures from either host being capable of infecting the other though with diminished virulence. These strains do not attack cotton, nor can the strain from cotton [ibid., v, p. 768] infect either sann-hemp or pigeon pea. The fungus is frequently carried on the seed from infected plants, and seed disinfection with uspulun or mercuric chloride is recommended.

Wilting of sann-hemp and pigeon pea is also caused in Pusa to a minor extent by *Rhizoctonia* [*Corticium*] *solani* and *Neocosmospora vasinfecta* [ibid., vi, p. 123; ix, pp. 33, 736], especially during the earlier, warmer part of the season. Pot experiments in which the soil was inoculated with *N. vasinfecta* are considered to show that this fungus can cause a high percentage of wilt in sann-hemp.

Zacharewicz (E.). **Pourriture grise. Comment la combattre.** [Grey rot. How to control it.]—*Prog. Agric. et Vitic.*, cii, 35, pp. 229–231, 1934.

The author states that serious outbreaks of grey rot of grapes (*Botrytis cinerea*) usually occur in low-lying, poorly aerated vineyards in the plains, at the time when the grapes begin to change colour prior to the final maturation period, and that the disease is particularly dangerous to the thin-skinned and juicy varieties. The trouble may be considerably reduced by pruning so that the fruiting branches are kept rather high up on the stocks, and by thinning out the foliage at the base of the stock, where it is too dense, to ensure a better circulation of air around the fruit. The best control, however, is obtained by dusting the bunches with a copper-containing dust, such as, for instance, that composed of 55 kg. calcined plaster of Paris [calcium sulphate], 40 kg. sulphosteatite with 20 per cent. copper sulphate, and 5 kg. saponaphtha powder. The dustings should be done after spraying the vines with Bordeaux mixture, as soon as the spray is dry.

Faes (H.). **Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. Rapport annuel 1933.** [Annual report for 1933 of the Federal Viticultural Experiment Station at Lausanne and Domaine de Pully.]—*Ann. Agric. de la Suisse*, xxxv, 8, pp. 919–962, 2 figs., 3 graphs, 1934.

Brief notes of general phytopathological interest are given on the occurrence and control of the diseases of vines, other fruits, and miscellaneous cultivated plants in the vicinity of Lausanne during 1933 [cf. *R.A.M.*, xiii, p. 77].

Park (M.). **Report on the work of the Mycological Division.**—*Ceylon Administration Reports, Report of the Director of Agric. for 1933*, pp. D126–D133, 1934.

In 1933, areca palms (*Areca catechu*) in Ceylon developed a disease marked by a dwindling or tapering of the leaves, which turned an unhealthy green, those produced subsequently becoming progressively smaller, until the head was considerably reduced; the yield of nuts from the affected trees declined rapidly. The symptoms suggest that this disease may be caused by a virus.

A thick cover of *Dolichos hosei* [*Vigna oligosperma*] favoured the swift spread of *Fomes lignosus* on *Hevea* rubber [*R.A.M.*, viii, p. 333]. Bitten leaf of coco-nuts (*Ceratostomella paradoxa*) [ibid., vii, p. 629; xiii, p. 79], recorded for the first time in Ceylon, was frequently followed by a secondary rot of the 'cabbage', with resultant destruction of the bud, at which stage the disease may be confused with bud rot [*Phytophthora palmivora*: ibid., xii, p. 77]; inoculations with pure cultures of *C. paradoxa* gave positive results only through wounds.

As spraying, though it considerably reduced citrus canker [*Pseudomonas citri*: ibid., xiii, p. 78], did not prevent considerable damage, an experiment was conducted in which every infected leaf, twig, and fruit was systematically removed; the trees remained clean and reinfection became progressively rarer.

When citrus trees were inoculated with pure cultures of *Corticium salmonicolor* isolated from apple and citrus twigs parasitism was equally pronounced in each case, indicating the absence of biological strains; positive infection was readily obtained without wounding.

Other new records include *Ustulina zonata* causing a root disease of areca palms, *Oidiopsis taurica* [ibid., xi, p. 183; cf. also xii, p. 747] on *Capsicum annuum*, *Gloeosporium* (?) *limetticolum* causing anthracnose of immature orange fruits, soft rot of turmeric (*Curcuma longa*) due to *Pythium* (?) *butleri*, species of *Oidium* on *Hydrangea hortensia* and *Manihot dichotoma*, *O.* (?) *balsamii* on green gram (*Phaseolus aureus*), *Bacterium solanacearum* on *Physalis peruviana*, and a soft rot of ginger caused by *P.* (?) *butleri*.

Storey (H. H.). **Report of the Plant Pathologist.**—*Sixth Ann. Rept. East African Agric. Res. Stat., Amani, 1933–34*, pp. 10–14, 1934.

Recent researches on maize streak are stated to admit of an alternative explanation of the continued infectivity of the insect vectors (*Cicadulina mbila* and *C. zeae*) receiving no additional supply of virus to that involving multiplication of the infective principle within the insect's body, and the writer now regards the question whether there is such a multiplication as an open one [*R.A.M.*, xii, p. 748; xiii, p. 571]. Complete inactivation of the streak virus has been obtained by the addition of methylene blue (1 in 10,000 or 1 in 100,000) and exposure to diffuse daylight [see below, p. 186].

Satisfactory evidence has been secured under carefully controlled greenhouse conditions that cassava mosaic [ibid., xii, p. 748] is transmitted by a species of whitefly (Aleyrodidae). All the cassava varieties at present available have been shown by grafting experiments to be susceptible to mosaic, including six from Uganda originating in the West Indies and two from the Gold Coast, the latter being highly resistant in their native locality but susceptible to graft infection at Amani.

Botany. *Ex* Work of the Agricultural Experiment Station. Report of the Director for the year ending June 30, 1933.—*Missouri Agric. Exper. Stat. Bull.* 340, pp. 28–34, 1934.

Among other items of phytopathological interest in this report the following may be mentioned. C. M. Tucker and C. G. Schmitt controlled damping-off of tomato seedlings caused by *Pythium de Baryanum* [*R.A.M.*, viii, p. 140] by the application to the soil of Du Bay 738, containing ethyl mercury phosphate as the active ingredient [ibid., xi, p. 491; xiv, p. 74], at the rate of 1 gm. per 5 in. pot. Some stunting and delay in germination resulted from the treatment, but after 30 days the number of healthy seedlings exceeded those in the control pots by more than $2\frac{1}{2}$ times. The fungicide proved less effective in an acid (P_H 5·6) than in an alkaline soil (up to P_H 8·5), probably on account of the combined inhibitory action on the seedlings of the mercurial and the toxic sulphurous ion from the sulphuric acid with which the pots were supplied in the former series.

Bacterium [*Pseudomonas*] *tolaasii* caused a spotting of cultivated mushroom [*Psalliota campestris* and *P. arvensis*: ibid., xiii, p. 213] caps.

Sclerotium delphinii [ibid., xiii, p. 387] was examined by C. M. Tucker on *Delphinium* spp., *Physostegia virginiana, Lilium regale,* and *Iris* spp., and it was also isolated from soil. The largest sclerotia were formed on onion agar. The optimum temperature for growth was found to lie between 30° and 35° C., with a maximum at 37·5° to 40° and a thermal death point of 48° to 50°. Sclerotia stored for four months at various temperatures between 3° and 37·5° remained viable, as did those exposed to outdoor winter temperatures. The optimum hydrogen-ion concentration for growth of *S. delphinii* was found to be about P_H 4·5. A comparison of this fungus with *S. rolfsii* from Florida indicated that the two species are distinct. *S. delphinii* was killed in five minutes by 0·0105 per cent. ethyl mercury phosphate (Du Bay).

During the period under review C. M. Tucker also made cultural studies on 58 strains of *Phytophthora* received from various parts of the United States, South Africa, India, Japan, Scotland, Holland, and Burma. Among the more interesting identifications on new hosts are *P. parasitica* on *Piper betle* (Burma) [ibid., xiv, p. 122] and on *Lilium elegans* (Japan), *P. cinnamomi* [see below, p. 194] on chestnut (*Castanea dentata*) in the south-eastern United States, *P. cactorum* on loquat and *L. dauricum* (Japan), and *P. drechsleri* [ibid., x, p. 755] on sugar beet in Utah and California. In Boone County, Missouri, species of *Phytophthora* not yet identified were isolated from *Nigella damascena, Campanula persicifolia, Gypsophila paniculata, L.* spp., *D.* spp., and carnations. Two of the thirteen isolations from *N. damascena* produced oospores in oogonia with paragynous antheridia at 25°. Wounded apple fruits were infected by these strains as well as by the eleven from the same host producing only chlamydospores and sporangia. About half the latter also proved pathogenic to potato tubers, causing the infected tissue to turn pink on exposure to air. Both groups attacked the *Nigella* plants through stem or root wounds and through the soil, causing cortical softening and blackening.

Garden, orchard and cash crops. Plant diseases. *Ex* Our changing agriculture served by science. Annual Report of the Director Wisconsin Agricultural Experiment Station 1932–1933.—*Wisconsin Agric. Exper. Stat. Bull.* 428, pp. 76–96, 4 figs., 1 graph, 1934.

In addition to items already noticed from other sources, these sections of the Wisconsin agricultural report for 1932–3 contain much information of interest. Very promising results have been obtained by J. Johnson and F. S. Henika in the development of tobacco strains combining the desirable qualities of Havana No. 38 with the resistance to black root rot [*Thielaviopsis basicola*: *R.A.M.*, viii, p. 613; xiii, p. 13] of Havana 142.

J. W. Brann compiled data showing a steady advance in the health of seed potatoes as a result of the tuber index method of mosaic detection [ibid., xii, p. 50]. The Triumph variety suffers particularly severely from mosaic, the incidence of which, however, may be much reduced by the use of northern-grown seed. Yellow dwarf [ibid., xiii, p. 721] has been found by J. C. Walker and K. Koch to be responsible for heavy reductions in the potato yield. The eye index method extensively used for crinkle detection [ibid., xii, p. 50] cannot be applied to yellow dwarf,

signs of which may be apparent on one section of a tuber and not on another; it is necessary, therefore, to examine the entire tuber to be sure of freedom from the disease.

Full details are given of observations by G. W. Keitt and collaborators pointing to the importance of rain in the dissemination of fire-blight (*Erwinia amylovora*) [*Bacillus amylovorus*] on the blossom and twigs of apple trees. Apple scab [*Venturia inaequalis*] on the Dudley and Wealthy varieties was well controlled by six applications of 1 in 40 or 1 in 60 lime-sulphur, 5–50 flotation sulphur, and 3–50 or 2–50 colloidal sulphur, infection being reduced from 91·7 and 73·6 per cent., respectively, to less than 1 per cent.

A. J. Riker and co-workers found that glucose is utilized by the crown gall and hairy root bacteria [*Bacterium tumefaciens* and *Bact. rhizogenes*: ibid., xiii, p. 776] for cell, gum, carbon dioxide, and acid formation, acid being produced much more abundantly by the latter organism; the volatile acid was ascertained to be acetic and the non-volatile pyruvic.

W. H. Pierce and J. C. Walker have developed two bean [*Phaseolus vulgaris*] lines from crosses between Corbett Refugee and Refugee Green [ibid., xiii, p. 488] combining mosaic resistance and other desirable features; they are named Idaho Refugee (early) and Wisconsin Refugee (late). All the F_1 plants in these crosses proved resistant to mosaic, but in the F_2 15 per cent. reverted to the susceptible condition.

Fusarium yellows of celery [see above, p. 142] has been reported from several sections of the State.

In a series of tests by J. C. Walker and R. H. Larson on the varietal reaction of cabbage, swedes, and turnips to club root (*Plasmodiophora brassicae*) [ibid., xiii, p. 9], no indication of resistance was found in any strains or individuals of the first-named. Complete resistance was shown, however, by all the four swede varieties tested, viz., White Russian, White Neckless, Wilhelmsburger, and Bangholm, and by two turnips, May and Snowball; 88 per cent. resistant plants were further found among the Purple Top White Leaf and Purple Top Strap Leaf varieties [cf. ibid., xiii, p. 343] and 84 per cent. in Cowhorn, while Shogoin was entirely susceptible.

J. C. Walker and W. C. Snyder ascertained by means of experimental plantings that the pea wilt fungus (*F. orthoceras* var. *pisi*) [ibid., xiv, p. 71] is much more prevalent in sandy than in silt loam or red clay soils.

Field crops. *Ex* Our changing agriculture served by science. Annual Report Wisconsin Agricultural Experiment Station 1932–1933.—*Wisconsin Agric. Exper. Stat. Bull.* 428, pp. 65–75, 3 figs., 1934.

The following items of phytopathological interest occur in this report. From a large number of hybrid oat varieties resistant to smut [*Ustilago avenae*] supplied by the United States Department of Agriculture, 19 lines have been selected by J. G. Dickson, B. D. Leith, and H. L. Shands as promising for Wisconsin. To date the numbers of selected lines at the Station are 448 for rust [*Puccinia lolii*] resistance, 139 for smut resistance, and 14 for combined resistance to smut and rust [cf. *R.A.M.*, xiii, p. 434].

R. A. Brink, H. R. Albrecht, and F. R. Jones have found in the course of extensive breeding tests that the capacity of individual lucerne plants

to transmit their own high degree of resistance to bacterial wilt (*Aplanobacter insidiosum*) [ibid., xiv, p. 109] varies extremely, indicating the complexity of the genetic basis for the character. Several crosses between typical Grimm (susceptible) plants and resistant individuals of Turkestan origin resulted in less than 10 per cent. resistant progeny in the F_2 generation. On the other hand, two similar crosses in which the susceptible parents were of the Hardy Peruvian variety gave a larger number of resistant offspring, comparable results being also obtained with a Turkestan × *Medicago falcata* hybrid. It would appear from these data that the Grimm variety carries a complex of genes conditioning reaction to wilt that greatly limits the number of resistant segregates in crosses with highly resistant types.

Botany and plant pathology section.—*Ann. Rept. Iowa Agric. Exper. Stat. for the year ending June 30, 1933*, pp. 44–58, 2 figs., 1933. [Received December, 1934.]

Among the numerous items of interest in this report, some of which have already been noticed from other sources, the following may be mentioned. C. S. Reddy and E. W. Lindstrom found that the critical hydrogen-ion concentration for the infection of maize cobs by *Basisporium gallarum* [*Nigrospora* sp.: *R.A.M.*, xii, p. 268; xiii, p. 299] is P_H 5·2, above which point little rotting of the ears occurs in inbred lines.

Thirty-three physiologic forms of crown rust of oats [*Puccinia lolii*] have been identified by H. C. Murphy among 533 collections from 29 of the United States, three Canadian Provinces, and three Mexican States during the period 1927–32, forms 1 and 7 being again the most widespread in the year under review [ibid., xii, p. 269]. These two forms consistently overwintered in the south, the former also overwintering on *Rhamnus lanceolata* in the north. Form 3, the next in order of prevalence, appears to depend for its initial spread to oats on *R. cathartica*. A new and important form, 33, apparently arose as a mutant of 1.

In laboratory tests by R. H. Porter, E. O. Brown, and C. M. King, the average percentage of scab (*Gibberella saubinetii*) on barley seed-grain [ibid., xii, p. 614] was 9·6 and the highest 36·5; in 20 farmers' seed lots there was an average of 5·5 per cent. infection (10 per cent. when estimated by the blotter test). When seed samples of Colsess, Glabron, Spartan, Velvet, and Minsturdi were planted in sterile soil, the average percentages of weak and blighted seedlings were 18 and 17·8, respectively, indicating a close relationship between the two classes.

In 1932 *Cercospora beticola* [ibid., xiii, p. 415] was first observed in northern Iowa on 22nd July, from which date onwards extensive data were collected by S. M. Dietz pointing to the origin of infection in centres throughout the field, spread being more rapid and the symptoms more severe in drilled than in checked plots; the yield from the latter averaged 2·8 tons per acre more than from the former. The following plants showed spontaneous infection by *C. beticola* in the field: *Amaranthus retroflexus*, *Chenopodium album* [ibid., xii, p. 269], *Malva rotundifolia*, *Polygonum convolvulus*, *Melilotus alba*, and lettuce. The outcome of preliminary trials indicates that the fungus is soil-borne and able to initiate infection from the soil on young beet leaves.

The sweet potato slip disinfectants, semesan bel, semesan, and corona PD 7, reduced the total percentage of stem rot [*Fusarium batatatis* and *F. hyperoxysporum*: ibid., xi, p. 535] from 51·7 to an average of 33·1 in D. V. Layton's tests, the average yield per acre from the treated material being 195·8 bushels compared with 170·8 from the controls.

Phoma terrestris was found by I. E. Melhus and W. J. Henderson to be the primary agent of onion bulb rot, with *F. zonatum* as a secondary invader [ibid., xii, p. 269]. Both fungi grow best between 26° and 29° C., the optimum hydrogen-ion concentration for the development of the former being P_H 4·2 to 7·0 and for the latter 5·0 to 6·0.

G. L. McNew states that in addition to the common red cedar [*Juniperus virginiana*], the silver cedar (*J. scopulorum*) is also susceptible to the cedar rust, *Gymnosporangium* [*juniperi-virginianae*: ibid., xiii, p. 780], but all *J. communis* and *J. chinensis* varieties investigated appear to be resistant. Of the ten common apple varieties exposed to infection by rust collections from 26 localities, Delicious and Northwestern Greening were the most resistant, followed by Tolman's Sweet. *Phomopsis* blight of red cedars caused over 14 per cent. mortality in one summer on three-year-old seedlings, and was present on nearly 95 per cent. of older trees in the field. Good control was obtained by excision of the diseased material and spraying with Bordeaux mixture and a miscible oil (1 in 200).

The same worker's experiments (covering a four-year period and involving the use of 34 preparations) on cherry yellow leaf (*Coccomyces hiemalis*) control in 75 blocks of one-year-old trees showed that Bordeaux mixture 4–6–50, preferably with the addition of calcium caseinate or a miscible oil, is the most generally satisfactory treatment, applied at ten-day intervals from the time the seedlings are 6 in. high until the middle of August or later. In two nurseries the records for two years show that the treatment of each tree costs about ½ cent and confers an increased value of 1 to 3 cents by the end of the first season.

MARTIN (W. H.). **Plant pathology.**—*Fifty-third and fifty-fourth Ann. Repts.* (*First Bienn. Rept.*) *New Jersey Agric. Exper. Stat. for the 2-year period ending June 30, 1933*, pp. 57–66, [? 1933. Received December, 1934.]

This report contains much useful information, some of which has already been noticed from other sources; the following may be mentioned here. Promising results in the control of scab [*Actinomyces scabies*] and *Rhizoctonia* [*Corticium*] *solani* on potatoes were given by the incorporation with the fertilizer of calomel [mercurous chloride] and yellow oxide of mercury at the rate of 3 and 6 lb. per ton, but there was a tendency to retarded germination and reduced yield in the case of the larger doses [*R.A.M.*, xi, p. 355; xiv, p. 118]. In a test to determine the effect of planting depth and soil moisture content on the incidence of *C. solani*, the largest amount of severe infection (67·4 per cent.) occurred at 5½ in. with a moisture content of 60 per cent.

A copper fungicide, coposil, reduced the amount of apple scab [*Venturia inaequalis*] from 81 to 4 per cent. In 1932 flotation sulphur in powder form proved to be equally effective in scab control with the paste [ibid., xiii, p. 34, 358]; used at proper concentrations from the

pink application onwards this fungicide was equally efficacious with lime-sulphur 1 in 50 and caused practically no burning. Bentonite sulphur [ibid., xiii, p. 715] was as useful as any of the standard sulphurs for the control of scab, and adhered slightly better than flotation sulphur for the first ten days after spraying. The best adhesion, however, was obtained with lime-sulphur. Dry lime-sulphur was as good as the liquid form against scab but caused serious defoliation. Brooks's fruit spot [*Mycosphaerella pomi*: ibid., xi, p. 355; xiii, p. 171] was well controlled by Bordeaux mixture 1–4–50, but not by any of the sulphur sprays; coposil was effective against this disease, and caused no injury to foliage or fruit either alone or in combination with 0·5 per cent. oil as a summer spray.

A high degree of resistance to *Aplanobacter stewarti* [ibid., xiii, p. 571] has been shown by the early white Vanguard and the late yellow Bantam Evergreen maize varieties.

Phomopsis vexans, the agent of fruit rot of eggplant [ibid., xi, p. 356; xii, p. 395], has been found to penetrate the seed coat and to survive 30 minutes' immersion of the seed in mercuric chloride 1 in 1,000; it is generally destroyed, however, by 30 or 10 minutes' soaking in hot water at 50° or 55° C., respectively.

Root rot of peas (*Aphanomyces*) [*euteiches*: ibid., xiii, p. 3] was successfully combated by the application of commercial fertilizers at the rate of 2,000 lb. or more per acre, the nitrogen constituent being the most active in the reduction of infection. The treatment should not be given until four or five days after sowing the seed in order to avoid direct contact between the latter and the nitrogen carriers, which may otherwise cause severe rotting.

Club root of rape [*Plasmodiophora brassicae*] was sufficiently checked by repeated applications of lime over a lengthy period to give yield increases of 418 and 44 per cent. in 1931 and 1932 (early and late infections), respectively [ibid., xiii, p. 740]. The infection percentages on the heavily limed plots were 18·3 and 8·5 per cent., respectively, in the two years, as compared with 93·2 and 45·7 on the untreated. In 1932 the incidence of the disease was reduced from 75 to 17 per cent. by the application of calcium cyanamide at the rate of 1,200 lb. per acre.

Seed transmission of tomato wilt (*Fusarium*) [*lycopersici* or *bulbigenum* form 1: ibid., xi, p. 355; xiii, p. 194] was demonstrated in three out of six lots of seed from diseased plants, but none of the 2,395 tomato plants raised from seed from plants infected with canker (*Aplanobacter michiganense*) in 1931–2 developed the disease [ibid., x, p. 136 *et passim*].

Satisfactory control of *Phoma betae* was obtained on a commercial scale by 30 minutes' immersion of the seed-clusters in hot water at 55° [cf. ibid., xi, p. 356].

Excellent control of seed decay and damping-off [?*Pythium* spp. and *C. solani*] of eggplant, tomato, pepper [*Capsicum annuum*], spinach, cabbage, cucumber, peas, sweet peas, and in some cases Lima beans [*Phaseolus lunatus*] has been secured with red copper oxide dust [ibid., xiii, p. 644]. Applied at the rate of 1½ oz. per sq. ft. of surface and mixed with the upper 3 in. of soil, 6 per cent. formalin dust was effective in a number of vegetables, while in cucumbers these disorders were well

controlled by soil treatment with calcium cyanamide (1,000 to 2,000 lb. per acre) a week before planting.

A species of *Pestalozzia* was found to be a primary pathogen of the fern *Cibotium schiedei*, causing the death of the frondlets and sometimes of complete fronds.

Van Der Goot (P.). **Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1932.** [Diseases and pests of cultivated plants in the Dutch East Indies in 1932.]—*Meded. Inst. voor Plantenziekten*, 83, 80 pp., 1934.

Among the numerous items of interest in this report, prepared on the usual lines [*R.A.M.*, xiii, p. 686], the following may be mentioned. The incidence of root rot of rice in the Bantam and Pekalongan Residencies of Java showed a decline as compared with the previous year, the chief damage being in the late west monsoon plantings. The cultivation of the resistant Brondol poetih and Chingfow varieties will be encouraged by the phytopathological and local authorities. Appreciable damage was caused by the disease in the Bodjonegoro Residency, involving 13,003 hect. and in Soerabaja (nearly 6,000 hect.).

In one part of the Banjoemas Residency (Java) an infectious bacterial disease finally exterminated the already diminishing coco-nut insect pest, *Brachartona catoxantha*, early in 1932; elsewhere combined bacterial and fungal attacks acted similarly during the west monsoon of 1932–3. A gummosis of coco-nut in Timor, causing sterility and gradual necrosis, appears to be of physiological origin.

In west Borneo *Hevea* rubber was more severely attacked by pink disease (*Corticium salmonicolor*) than in the previous year, the clone BR I being apparently specially susceptible on marshy soils. The West Java Experiment Station reported an outbreak of black root rot caused by *Rosellinia bunodes* on rubber [ibid., ix, p. 129; cf. also xiii, p. 687] in the Bandjar district, involving some 1,000 trees. Mildew (*Oidium heveae*) [ibid., xii, p. 323] was also prevalent, and little or nothing is done at present to combat it either in west or central Java.

Top die-back of coffee [*Rhizoctonia* sp.: ibid., xii, p. 286] was widespread on the west coast of Sumatra, where the Bangelan 105/03 variety shows marked susceptibility. With a view to control, the affected trees are cut down to the stump and two suckers allowed to develop. There was no appreciable extension of the disease in central or eastern Java.

Coryneum myristicae [ibid., xiii, p. 686] was once more responsible for heavy damage to the nutmeg crops in the Atjeh Residency (50 per cent. of inferior produce) and central Java.

The die-back of pepper [*Piper nigrum*] vines [ibid., xii, p. 425] continued to spread in Atjeh. Foot rot (*Phytophthora* sp.) occurred in epidemic form on this crop in west Borneo (Bengkajang subdivision), destroyed 12,000 vines in Paroenkoedjang (Java), and also caused heavy damage in Benkoelen (Sumatra), a disturbing feature of the disease in the latter region being its tendency to progress in an upward direction in sloping gardens. *Corticium salmonicolor* and a *Marasmius* also infected pepper in west Borneo, while in Bangka (Sumatra) chlorosis spread extensively.

The Hybrid No. 3 groundnut variety was attacked by slime disease

[*Bacterium solanacearum*: ibid., vii, p. 307] in five localities of Sumatra, where it was consequently replaced by Schwarz No. 21 from Java.

In the Buitenzorg district of Java mildew (*Oidium*) [*tingitaninum*: ibid., vii, p. 675] was very troublesome on citrus, occurring during flowering or at the inception of fruit setting.

As in previous years, sugar-cane diseases were only of importance in relation to the P.O.J. 2878 variety, which constitutes the bulk of the crop. Yellow spot (*Cercospora kopkei*) developed in the Pasoeroean district of Java later in the season than in 1931 [ibid., xiii, p. 686], no extensive spread being observed before the second half of March and the incidence of infection declining by May. In Cheribon, *Fusarium moniliforme* [*Gibberella moniliformis*: ibid., xiv, p. 84] was found in a virulent form as early as January, both in the leaf and the more serious top infection phases.

Tobacco at the Besoeki Experiment Station was attacked in the seed-beds by *Pythium aphanidermatum* [ibid., xiii, p. 599], which appears, contrary to the situation in the Vorstenland, to be on the increase. Undoubtedly it is frequently confused with *Phytophthora* [*parasitica*] at a certain stage of development. Once the seedlings had reached the transplanting stage they seemed to be immune from infection.

Cabbage in the Fort van der Capellen district and elsewhere on the west coast of Sumatra was damaged by *Bact. campestre* [*Pseudomonas campestris*: ibid., xii, p. 425].

Sonokling [*Pterocarpus indicus*] and mahogany [*Swietenia mahagoni* and *S. macrophylla*: ibid., vi, p. 63] were attacked in Java by *Fomes noxius* [ibid., xiii, p. 726; xiv, p. 81], and *Acacia* by *Rigidoporus microporus* [*F. lignosus*], while a young teak [*Tectona grandis*] planting suffered from *Bact. solanacearum.*

Derris microphylla was infected by *Diplodia* sp. in west and central Java [ibid., x, p. 525], by *Ustulina* sp. in the former, and by *Xylaria* sp. in the latter region.

The so-called 'lepra' disease of patchouli [*Pogostemon comosus*] was again much in evidence in Atjeh [cf. ibid., viii, p. 226], probably owing to the neglect of the plantations by reason of the low market price of the dried leaves.

Lilies in the Priangan Residency of Java were affected by a disorder probably identical with yellow flat [ibid., xi, pp. 97, 244] which led to the virtual cessation of cultivation in the particular centre involved.

A species of *Marasmius* caused sporadic die-back of ramboetan [*Nephelium lappaceum*] branches in the vicinity of Batavia.

Mallamaire (A.). **L'année phytopathologique en Côte-d'Ivoire.** [The year's phytopathology on the Ivory Coast.]—*Agron. Colon.*, xxiii, 202, pp. 114–119, 1934.

During 1933, heavy rains on the lower Ivory Coast greatly favoured the development of *Trachysphaera fructigena* [*R.A.M.*, ii, p. 495] on the 'cherries' [fruit] of Liberian coffee bushes; in one locality comprising 4,500 hect. of coffee, important losses were sustained. Effective control is given by strongly adhesive cupric mixtures at a concentration of 3 per cent.

Marasmius scandens [ibid., xii, p. 207] was prevalent on coffee and

cacao. *Corticium koleroga* [ibid., xiii, pp. 230, 574] was noted for the first time on coffee bushes at Bingerville Agricultural Station.

As a result of planting with suckers from diseased mother plants Chinese banana [*Musa cavendishii*] plantations laid down in 1932 and early in 1933 became affected with *M. stenophyllus* Mont. (*M. semiustus* Mass.) [ibid., xiii, p. 352].

Chevalier (A.). **Les Rubiacées à bactéries fixatrices d'azote.** [Rubiaceae with nitrogen-fixing bacteria.]—*Rev. de Bot. Appliquée et d'Agric. Trop.*, xiv, 156–157, pp. 633–643, 1 pl., 1934.

After a reference to previous records in literature of species of the Rubiaceae with leaves commonly bearing nodules containing nitrogen-fixing bacteria [*R.A.M.*, xiii, p. 219], the author states that he found bacterial pustules in the leaves of numerous species of *Pavetta* preserved at the Museum at Paris, and also not infrequently in collected leaves of certain *Pavetta* species from tropical Africa; similar nodules were also observed by him in the leaves of two species of *Ixora* from west Africa. A brief description is also given of the small leaf depressions to which the name 'domatia' has been given and which the author found in wild coffee (*Coffea arabica* and *C. liberica*); these are considered to be bacterial organs of the same nature as those of *Pavetta*. Some notes are further given on similar formations found in other species of Rubiaceae, including *Psychotria* spp., *Lasianthus* spp., and some epiphytic myrmecophilous plants, and in species of *Ardisia* of the Myrsinaceae.

Dufrénoy (J.). **Effets d'un bactériophage sur l'appareil vacuolaire du Bacterium tabacum.** [The effects of a bacteriophage on the vacuolar system of *Bacterium tabacum*.]—*Comptes rendus Soc. de Biol.*, cxvii, 30, pp. 373–374, 1 fig., 1934.

Bacterium tabacum, attacked by a bacteriophage derived from cultures of the same organism at Gembloux [Belgium], showed a swelling, agglutination, or fragmentation of the vacuoles—effects which are considered to bring the action of the bacteriophage (the virulence of which in the present case was enhanced by three passages through bouillon cultures followed by filtration through a Chamberland L^3 candle) into line with that of the plant viruses [cf. *R.A.M.*, xiii, p. 589].

Clark (G. E. M.). **Evidence suggestive of the existence of a filterable stage of Bacterium tumefaciens.**—Abs. in *Phytopath.*, xxiv, 10, p. 1139, 1934.

A single strain of *Bacterium tumefaciens* was grown in nutrient broth, and cultures aged from 2 to 43 days were passed through a Berkefeld 'N' filter [cf. *R.A.M.*, xii, p. 81]. Five out of eight filtrates yielded the organism in a pathogenic form. Four out of six filtrates from milk cultures also yielded *Bact. tumefaciens* in a pathogenic form. In the first of these series direct inoculation of the filtrate into *Bryophyllum calycinum* gave only one positive result, while in the second no certain positive result was obtained. The outcome of three experiments with filtrates from crushed crown galls was negative. Two originally identical strains, only one of which was pathogenic to *B. calycinum*, gave rise to rough and smooth types of *Bact. tumefaciens* after three months in litmus

milk [ibid., xi, p. 226]. In the pathogenic strain the rough type was the more virulent.

MYERS (J. G.). **Observations on wild Cacao and wild Bananas in British Guiana.**—*Trop. Agriculture*, xi, 10, pp. 263–267, 1934.

In this account of his journey in the Amazon Basin in 1932 [*R.A.M.*, xiii, p. 687], the author states that the complete absence of witches' broom disease [*Marasmius perniciosus*] in the wild cacao he saw in the Kanuku mountains was in marked contrast to the badly diseased condition of the wild cacao he had previously observed on the Coppename river, in the interior of Surinam, with which the Kanuku cacao is obviously identical. Offspring of the Coppename plants are now growing at the Imperial College of Tropical Agriculture in Trinidad, and at Kew, and are of the type which Pittier and others consider to be a distinct species (*Theobroma leiocarpa*).

Notes are also given on wild bananas and plantains which the author found during his journey, including a reference to Sir Robert Schomburgk's statement that during his travels [1835–9] in Guiana he observed on the coast of British Guiana a peculiar disease in *Musa* plantations, which 'starts from the innermost vascular bundles which take on a brownish colour intermixed with a number of black spots'. This is believed to be probably the first reference to Panama disease [*Fusarium oxysporum cubense*] or something very similar [e.g. bacterial wilt (*Bacterium solanacearum*): ibid., xiii, p. 788].

KULKARNI (L. G.). **Correlated inheritance with special reference to disease resistance in spring Wheat.**—*Journ. Amer. Soc. Agron.*, xxvi, 10, pp. 885–893, 1934.

The writer found, in his studies [the results of which are discussed and tabulated] at St. Paul, Minnesota, on the inheritance of reaction to a collection of 23 physiologic forms of stem [black] rust [*Puccinia graminis*] in the F_3 lines of a cross between the highly resistant Hope and the very susceptible Liguleless wheat varieties, that resistance is conferred by a dominant factor, R, carried by the former, and susceptibility (in the presence of R) by an inhibitory factor, I, carried by the latter [cf. *R.A.M.*, xiii, p. 428]. In the F_3 lines of crosses between Ceres and Hope and Ceres and Double Cross (semi-resistant), the Hope type of resistance was found to be differentiated by a single factor pair.

The differences in yield between semi-resistant and resistant wheat plants were found not to be statistically significant. A definite correlation was observed, however, between resistance to rust and plumpness of the seed.

Genotypic variations were observed in 70 out of 192 apparently homozygous hybrid lines tested to determine their type of seedling reaction to forms 21 and 36 of black rust [ibid., xii, pp. 556, 750].

COTTER (R. U.). **White pycnia and aecia of Puccinia graminis.**—*Phytopath.*, xxiv, 10, pp. 1121–1122, 1934.

A brief note is given on a white aecidial mutant of *Puccinia graminis agrostidis* that developed on barberry seedlings at St. Paul, Minnesota, as a result of inoculations which yielded 139 normal yellow and 37 white

pycnidia; a few of the latter gave white aecidia when the nectar of another similar pycnidium was transferred to them. The white aecidia were similar in size to the normal yellow ones but slightly different in shape. The spores were hyaline and the intercalary cells in the chains more conspicuous than those in the yellow ones. The aecidiospores of both white and yellow aecidia germinated normally in barley extract, those of the former group producing hyaline germ-tubes.

STEINER (H.). **Ueber den Einfluss der Saatzeit auf den herbstlichen Befall der Winterungen mit Braunrost (Puccinia triticina Erikss. und Puccinia dispersa Erikss.).** [On the influence of the sowing date on the autumn infection of winter cereals with brown rust (*Puccinia triticina* Erikss. and *Puccinia dispersa* Erikss.).]—*Landw. Jahrb.*, lxxx, 3, pp. 401–415, 6 figs., 1934.

A tabulated account is given of the writer's experiments in two localities of Austria on the influence of the sowing date (between 11th August and 8th November) on the incidence of brown rust (*Puccinia triticina* and *P. dispersa* [*P. secalina*]) in the winter wheat and rye crops, respectively [*R.A.M.*, xiii, p. 752]. The wheat varieties used in the tests were Kadolz and Voralpenbart and the rye Wiener-Wald.

It was found that early sowing, by promoting luxuriant growth and heavy tillering, at the same time favoured extensive rust infection in the autumn, particularly in the case of rye. Late-sown plants, on the other hand, with only a few leaves and no shoots at the critical period for attack, remained virtually free from rust.

LUTHRA (J. C.) & SATTAR (A.). **The loose smut disease of Wheat (vernacular, 'kangiari') and some new methods of its control.**—*Agric. & Live-Stock in India*, iv, 5, pp. 495–504, 2 figs., 1934.

This is a popular version of the authors' recent paper on simplified methods for the control of loose smut (*Ustilago tritici*) of wheat in the Punjab, India [*R.A.M.*, xiv, p. 22].

KRÁMSKÝ (O.). **Dreissig Beizstationen der landwirtschaftlichen Schule in Jicín.** [Thirty disinfecting stations of the Jicín Agricultural College.]—*Ratschläge für Haus, Garten, Feld*, ix, 9, pp. 154–156, 1934.

With a view to extending the practice of cereal seed-grain treatment among farmers in the vicinity of Jicín [Gitschin, Czecho-Slovakia], ex-students of the local Agricultural College were entrusted in 1930 with the establishment of 'disinfecting stations' to be distributed throughout the district. So successful was the propaganda in aid of the work, which included a film demonstration with technical explanations, that by the end of 1931 thirty such stations had been set up with the requisite apparatus and were actively functioning. During 1931–2 the stations used 700 kg. ceresan, corresponding (at a rate of 200 gm. per 100 kg. of seed-grain) to 35 wagon-loads of dusted material, i.e. sufficient to plant some 2,000 hect. It was decided, in the first instance, not to call upon the farmers for financial co-operation, but it is expected that in due course contributions towards the upkeep of the stations will be readily forthcoming.

Halle (J.). **Bekämpfung der Weizenfusskrankheiten.** [Control of Wheat foot rots.]—*Deutsche Landw. Presse*, lxi, 40, p. 494, 1934.

The writer's observations since 1928 in Pomerania have shown that the main requisite in the preceding crop in reducing the incidence of wheat root rot [*Ophiobolus graminis* and *Fusarium* spp.: *R.A.M.*, xii, pp. 23, 154, 432] is the provision of ample shade, which keeps the soil in a state of healthy tilth. The reason why barley in contrast to oats is such an unsuitable forerunner of wheat is that it affords so little shade; a similar objection applies under certain conditions to annual clover. The first consideration in planting sequence is that wheat shall be preceded by a crop giving sufficient shade to induce 'mellowness' in the soil, by reducing the effects of exposure to the sun and to drying out. Another important point is that timely stirring of the upper soil layers is of great assistance in promoting the requisite equilibrium, and should by no means be abandoned in favour of deep ploughing-under of the stubble.

Müller-Kögler (E.). **Die Anfälligkeit der Hauptgetreidearten gegenüber Ophiobolus graminis Sacc.** [The susceptibility of the chief cereal species towards *Ophiobolus graminis* Sacc.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliv, 10, pp. 481–485, 1934.

In order to determine the comparative reactions of the four chief cereals to the foot rot caused by *Ophiobolus graminis* [see preceding abstract], concerning which conflicting opinions are expressed, the writer conducted an experiment at the Kiel branch of the Biological Institute in the spring of 1934 with Peragis summer wheat, Ackermanns Isaria barley, Petkus summer rye, and v. Lochows yellow oats. The plants were divided into three lots, of which one was grown in a sterile soil-sand (1:3) mixture, the second in sterile compost, and the third in ordinary unsterilized soil. A layer of inoculum was placed in the soil at a depth of 2 cm. below the seed, which was sown on 4th April; the seedlings were removed for examination in two batches, one a month and the other 2½ months after planting.

At the first inspection all the wheat radicles in the soil-sand mixture were completely rotted and the cells choked with mycelium. A similar aspect was presented by the seedlings in compost, whereas those in unsterilized soil were somewhat less heavily infected [cf. *R.A.M.*, xii, p. 684]. The second examination revealed a total disintegration and permeation by the fungus of all but the youngest crown roots in the soil-sand and almost equally severe infection in compost. The haulm bases showed a black discoloration. In the unsterilized soil, on the other hand, the plants were only slightly affected. The course of the disease in barley was similar to the foregoing, but the attack was somewhat less virulent. Only half the rye seedlings examined after one month were attacked, the symptoms in the soil-sand mixture and unsterilized soil being more or less localized, while those in compost were even less conspicuous. After 2½ months the action of the fungus on rye plants in the soil-sand mixture was more apparent, all the radicles being disorganized and full of mycelium and the crown roots infected round the site of inoculation. In compost the effects of the disease were

negligible and in unsterilized soil also they were relatively mild. Oats were even less damaged than rye, the fungus being found after $2\frac{1}{2}$ months only in the dead epidermal and outer cortical cells, except at the actual site of inoculation, where the cortex was penetrated.

One important diagnostic character should be noted in the case of all four cereals, namely, the presence of dark-coloured hyphae on the surface of the roots, in the epidermal cells, in the intercellular spaces of the outer cortex, and (in severe attacks) in the central cylinder. In the cortical cells, on the other hand, and in mild cases also in the central cylinder, only a hyaline, slender mycelium of the fungus is found [ibid., xiii, p. 758].

Johnston (W. H.). **Studies on the dehulling of Barley kernels with sulphuric acid and on the inheritance of reaction to covered smut Ustilago hordei Pers. (K. & S.) infection in crosses between Glabron and Trebi Barleys.**—*Canadian Journ. of Res.*, xi, 4, pp. 458–473, 2 figs., 1934.

Following an introductory note on the importance of covered smut of barley (*Ustilago hordei*) in Canada and a review of the literature on the disease with special reference to environmental factors, physiologic specialization of the fungus, and the effects of dehulling the kernels on infection [*R.A.M.*, iii, p. 330], the writer fully describes and tabulates the results of his dehulling experiments and investigations on the inheritance of reaction to attack in F_3 crosses between the highly resistant Glabron and the moderately susceptible Trebi variety.

It was found that the use of concentrated sulphuric acid in the dehulling tests induced complications rendering the exact analysis of the hybrid reactions impossible. Although the hull showed a high degree of resistance to penetration by the acid, the percentage of emergence of seedlings from the treated seeds fluctuated widely, both in parent and hybrid material. Much of the mortality among the treated seeds arose from previous mechanical injury, while the seedlings were considerably damaged by *Penicillium* spp. Increased virulence of infection by *U. hordei* consequent on hull removal led to extreme distortion of the seedlings and failure to emerge.

The hybrids between Glabron and Trebi when inoculated after dehulling with sulphuric acid generally reflected the reactions of the parents to covered smut, and little evidence was forthcoming of a transgression towards increased susceptibility. Segregation for reaction to the disease was not sufficiently clear-cut to establish the mode of inheritance of this character. A slight correlation was demonstrated between smut reaction and plant height but none between smut reaction and barbing of awns or earliness of heading. Little difficulty should be presented by the development of strains combining earliness, smooth awns, and resistance to *U. hordei*.

Jones (G. H.). **Control of Barley diseases. I. Closed smut.**—*Min. of Agric. Egypt, Tech. & Sci. Service (Mycol. Sect.) Bull.* 142, 19 pp., 8 pl., 1934.

A search for a suitable method to replace formalin steeping for the control of barley closed smut (*Ustilago hordei*) under Egyptian condi-

tions led to the conclusion, which was supported by large-scale tests on ordinary farms, that from a practical point of view the best substitute consists in sulphur dusting. This was cheap, convenient, and gave over 90 per cent. control in addition to protecting the grain during storage from insect attack. The exact dosage required has yet to be determined; in most of the tests a dosage of 4 per 1,000 by weight was used. The method is at present in use on about 4 per cent. of the barley area in Lower Egypt, where the disease is most severe.

BÖNING (K.) & WALLNER (F.). **Versuche zur Bekämpfung der Netzfleckenkrankheit der Gerste (Helminthosporium teres Sacc.).** [Experiments in the control of net blotch disease of Barley (*Helminthosporium teres* Sacc.).]—*Prakt. Blätter für Pflanzenbau u. Pflanzenschutz*, xii, 7, pp. 219–229, 2 figs., 1934.

Whereas the incidence of barley stripe (*Helminthosporium gramineum*) in Germany shows a general tendency to decline consequent on the widespread practice of seed-grain disinfection, net blotch (*H. teres*) [*R.A.M.*, x, p. 514; xiii, p. 296] appears to be on the increase all over Bavaria and, in fact, throughout the country. Occasionally the losses caused by this disease are very considerable, appreciably exceeding those due to stripe, the secondary spread of the fungus inducing premature defoliation with consequent weakening of the plants through the reduction of assimilatory capacity. Preliminary experiments in the control by seed disinfection of net blotch [the symptoms of which are briefly indicated] indicated that various brands of the standard dusts, ceresan and uspulun [ibid., xiv, p. 20], are likely to prove more effective for this purpose than the comparable liquid preparations, though entirely satisfactory results were in no case obtained, since primary infection was not completely eliminated and the few primarily infected plants served as sources of secondary spread. Observations on the relation between various fertilizing schedules and net blotch showed that the amount of infection is lowest where nitrogen is omitted, though no significant increase follows sparing applications of this element. All things considered, it would seem that the correct amount of nitrogen to maintain the crop in good condition with special reference to net blotch is 25 kg. per hect. The omission of potash and phosphoric acid is inadvisable as experiments showed that the disease was more severe in the unmanured plots than in those receiving these substances.

There appears to be no definite record of the occurrence of *H. sativum* in Germany, but the writers believe this organism to be responsible, not only for a leaf disease resembling the foregoing, but also for a foot rot of barley.

LEUKEL (R. W.) & STANTON (T. R.). **Effect of seed treatments on yield of Oats.**—*Journ. Amer. Soc. Agron.*, xxvi, 10, pp. 851–857, 1934.

The results [which are discussed and tabulated] of two years' experiments with several varieties of oats in Wisconsin, Illinois, and Iowa showed that no consistent increase of yield was obtained by the treatment of the seed-grain in the absence of smut [*Ustilago avenae* and *U. kolleri*] with various disinfectants.

Mundkur (B. B.). **Oat smut in India.**—*Indian Journ. Agric. Sci.*, iv, 5, pp. 895–898, 1 pl., 1934.

An examination of herbarium specimens of oat smuts at Pusa showed that most of them, though labelled *Ustilago avenae*, were actually *U. kolleri* [cf. *R.A.M.*, xiii, p. 224]. The former was found at Jagannathpur in 1903 and at Lahore in 1917, but it appears to be less prevalent in India than *U. kolleri*.

Mundkur (B. B.) & Khan (M. A.). **A dry spray method of treating Oat seed against covered smut.**—*Indian Journ. Agric. Sci.*, iv, 5, pp. 899–905, 1 pl., 1934.

Oat seed from a crop which the previous year had been heavily infected with *Ustilago kolleri* [see preceding abstract] was treated with concentrated formaldehyde diluted with an equal volume of water at the rate of 1 lb. per 24 maunds [1 maund = about 82 lb.]. In 96 acres sown with the treated seed not one plant subsequently developed infection, although the disease was very severe in the adjoining fields sown with untreated seed. The treatment, which did not impair germination, increased the yield over that of the controls by 20 per cent.

Clausen. **Weissseuche oder Urbarmachungskrankheit.** [White sickness or reclamation disease.]—*Mitt. für die Landw.*, xlix, 42, pp. 919–920, 2 figs., 1934.

A brief, popular note, based largely on Rademacher's observations [*R.A.M.*, x, p. 489], is given on the 'white sickness' or reclamation disease of cereals (chiefly oats) in Schleswig-Holstein. In the dry summer of 1934 the disease was prevalent notwithstanding plentiful manuring; a marked feature of the affected stands was the continuous tendency of the plants to form fresh, green shoots from the haulm nodes, even in the stubble stage; in some cases these new shoots attained a height of 0·50 m. and developed rudimentary panicles. Rademacher's conclusions in respect of the varietal reaction of oats to 'white sickness' were verified by the writer in a small-scale test. It is considered urgently necessary to replace the effective but inconvenient liquid copper sulphate treatment by a dry preparation that can readily be strewn over the field.

Stevens (N. E.). **Stewart's disease in relation to winter temperatures.**—*Plant Disease Reporter*, xviii, 12, pp. 141–149, 6 figs., 1934. [Mimeographed.]

From a consideration of the 'seasonal indices', i.e., simple summations of mean temperature and total rainfall as used by the United States Weather Bureau, for the four seasons, covering the period from 1901–34, an apparently significant correlation between winter temperatures and the incidence of Stewart's disease of maize (*Aplanobacter stewarti*) [*R.A.M.*, xiv, p. 94] may be deduced. No such correlation can as yet be detected between the total rainfall of any season or the temperature during spring, summer, and autumn. Accepting as a working hypothesis the idea that the disease will usually be absent in the north-eastern United States following a winter with an index (sum of the mean

temperatures of December, January, and February) below 90 and present in destructive amounts succeeding one with an index above 100 [calculated in degrees Fahrenheit], useful information may be gained by the study of a map indicating the normal winter temperature indices of certain maize-growing centres. Normal winter temperature indices above 100 are shown in southern Illinois, Indiana, and three districts of Ohio, at Baltimore (Maryland), Washington D.C., Charlottesville (Virginia), and various more southerly localities. As would be expected, the prevalence of the disease in these regions over a period of years has been such as to eliminate the susceptible varieties of sweet corn from commercial production. On the other hand, the normal winter temperature indices for the northern portions of Illinois, Indiana, Ohio, Pennsylvania, and New York, and all of New England north of Connecticut are close to or well below 80, indicating a degree of rarity of *A. stewarti* sufficient to permit of the cultivation of susceptible varieties. Here again the hypothesis holds good. An intermediate position as regards the winter temperature index is occupied by a zone including Long Island, much of New Jersey and southern Pennsylvania, and the higher parts of Maryland, where experience has shown that severe losses from the disease are exceptional but slight injury is liable to occur in the intervening periods. Data are presented in connexion with the winter temperature indices for 1930–4 fully substantiating the hypothesis herein outlined regarding the correlation between high winter temperatures and severe outbreaks of Stewart's disease.

MITRA (M.) & MEHTA (P. R.). **The effect of hydrogen ion concentration on the growth of Helminthosporium nodulosum B. et C. and H. leucostylum Drech.**—*Indian Journ. Agric. Sci.*, iv, 5, pp. 914–920, 1 graph, 1934.

A study of the effect of the P_H value of the medium on the growth of *Helminthosporium nodulosum* and *H. leucostylum*, both isolated from *Eleusine coracana* [*R.A.M.*, xii, p. 426], showed that in bacto-peptone solutions the spores of the former tolerated a P_H range from 3·8 to 10, the optimum for percentage germination and length of germ-tube lying between P_H 6·5 and 6·9; on Richards's solution (as shown by the dry weight) the optimum for *H. nodulosum* was P_H 7·1 and for *H. leucostylum* 6·7.

McCLEERY (F. C.). **Melanose of Citrus fruits.**—*Agric. Gaz. New South Wales*, xlv, 10, pp. 564–566, 1 pl., 1 fig., 1934.

Citrus melanose (*Phomopsis* [*Diaporthe*] *citri*) was first reported in New South Wales in 1897, and of recent years has become serious on oranges, lemons, and grapefruits in the coastal areas owing to the increasing quantity of dead wood in the citrus orchards as the trees grow older. Experimental evidence demonstrated that under the local conditions spraying should be effected immediately after petal-fall; though a second application one month later improved the results, the first treatment by itself gave satisfactory commercial control even in heavily infected orchards.

The author recommends one application of Bordeaux-oil spray (6–4–80–½) immediately after petal fall, the small fruits being thoroughly

wetted [*R.A.M.*, xiv, p. 96]. Lemons and grapefruits attacked by scab [*Sporotrichum citri*] as well as melanose should be given the earlier spray (just after half the flowers have shed their petals) advised for the former disease, which also gives fair control of melanose. During spraying particular attention should be paid to the fruits on the lower and inside branches, as these are the ones most severely attacked. Pruning alone does not give adequate control, and the removal of the small dead twigs that harbour *P. citri* is too tedious and laborious for commercial practice.

Reichert (I.) & Perlberger (J.). **Xyloporosis, the new Citrus disease (First Report).**—*Rehoboth (Palestine) Agric. Exper. Stat. Bull.* 12 (*Hadar*, vii, 7–8), 50 pp., 15 figs., 1934.

In 1930 enormous damage was caused in Palestine by a new non-parasitic disease of citrus, 'xyloporosis', first observed in 1928 [*R.A.M.*, x, p. 307], but which has already attacked nearly all the newly planted orchards. Only sweet lime [*Citrus medica* var. *limetta*] is susceptible, generally when budded with Jaffa orange (80 per cent. of the Jaffa oranges are budded on sweet lime in Palestine), but unbudded sweet lime may also be affected, especially underneath the limbs on the trunks of trees whose central stem has been pruned away. It was also found on sweet lime stocks grafted with sour lemon, grapefruit, and mandarin; it passes to the mandarin scion, but not to the sour lemon and grapefruit scions. One three-year-old Jaffa orange grafted on bitter orange [*C. aurantium* var. *bigaradia*] became affected. It is prevalent throughout most of the citrus-growing areas of Palestine and was also found in Syria and Cyprus, where the sweet lime is also used as a stock for oranges. During the last ten years the losses caused by it in Palestine are estimated at over £P1,000,000.

The first stage is characterized by the presence of small, roundish or ovoid depressions on the bark, the wood at these points containing small conoid pits with a brownish, pointed base; on the corresponding parts of the inside of the bark are small pegs, generally with brownish points, which fit into the pits.

In the second stage the depressions coalesce into large patches and bands, those below the union (which becomes covered by a knee-shaped swelling) being particularly noticeable. The wood and the bark near the cambium are dark brown, especially the pits with their corresponding pegs, the former being so numerous that the wood appears almost like a sieve. The bark tends to be a yellowish-brown, while the stem becomes elastic, and may be bent in any direction, the trees being liable to break down under the weight of their fruits. Some of the leaves are abnormally small and bright and often have yellow veins. The trees bloom luxuriantly and bear an abnormally heavy crop.

The third stage begins with a brownish discoloration of parts of the bark, generally extending over one-half of the stem below the union. The discoloured parts turn blackish, split, and flake off, the neighbouring wood developing a dry, dark decay. The leaves are small and yellow, and many of the branches slowly wither until finally the whole tree succumbs, though the roots remain active until the tree dies.

Internally the disease is marked by the growth failure of the annual

rings at the affected points, where cambial growth also ceases and a lesion develops which involves the cambium, phloem, and xylem. Carbohydrates accumulate in the fruit juice; in fruits from normal trees the percentages of soluble solids, sugar content, and reducing sugars were, respectively, 10·2 to 10·5, 5·6 to 6·7, and 3·7 to 3·9, as against 12·2 to 12·7, 7·5 to 8·25, and 5 to 5·5, respectively, for the fruit from affected trees.

The condition occurs in all types of soil, but is less prevalent in clay soils than in the other types. No relationship could be established between the incidence of the disease and manuring, irrigation, or climatic conditions. Prevalence increases with the age of the trees, and the disease is considered to have been present long before it was first recorded. Trees budded on two-year-old stocks are more susceptible than those on three-year-old stocks. Differences in the height of budding within the limits 30 to 60 cm. do not affect the development of the disease, but the condition is least severe on trees budded very low. Trees budded on the north-west are less susceptible than those budded on the south or south-west, and those budded on two or three branches of a stock are less affected than those budded on a single trunk. The origin of the seed had no effect on the disease.

Of the control methods practised, viz. cutting the bark and inarching, the latter appeared to be beneficial to affected trees.

It is concluded that xyloporosis is due to physiological factors the nature of which has not yet been determined.

KLOTZ (L. J.). **The use of nitrogen trichloride and other gases as fungicides.**—Abs. in *Phytopath.*, xxiv, 10, p. 1141, 1934.

Nitrogen trichloride gas at concentrations of only 4 to 6 mg. per cu. ft. was found to be lethal to heavy conidial plantings of *Penicillium digitatum* and *P. italicum* on filter paper and agar, and may well prove very valuable in the protection of citrus fruits from decay in storage rooms and transport [*R.A.M.*, xii, p. 615].

FAWCETT (H. S.) & WEINDLING (R.). **Types of Trichoderma rot of Lemons and Oranges.**—Abs. in *Phytopath.*, xxiv, 10, p. 1144, 1934.

In inoculation experiments [in California] on wounded mature lemons with 30 cultures of *Trichoderma* [see below, p. 188], the typical *Trichoderma* rot described by Fawcett and Lee in 'Citrus Diseases and their Control' [pp. 358, 364, 402] was consistently produced by *T. lignorum* [*R.A.M.*, xiii, p. 775] cultures with an odour resembling that of coconut. On the other hand, the non-odorous type forming a yellow pigment failed to cause the ordinary rot, though it sometimes invaded the core of the fruit several weeks after inoculation, inducing internal decay and finally breaking out on the rind. A third strain of the fungus, non-odorous and non-pigmented, caused yet another form of rotting, characterized by a lower infection percentage and firmer appearance than the typical *Trichoderma* decay, and by very slow development. Similar results on a smaller scale were obtained with the three forms of *T. lignorum* on Valencia oranges.

Some monospore cultures from an odorous isolation of the fungus

grew very slowly, gave off only a faint smell, and were non-pathogenic to lemons.

A culture of *T. koningi* [ibid., xi, p. 325 *et passim*] caused a fairly soft, buff-brown rot.

MAYNE (W. W.). **Annual Report of the Coffee Scientific Officer, 1933–1934.**—*Mysore Coffee Exper. Stat. Bull.* 12, 24 pp., 1934.

Further spraying trials conducted in southern India against coffee diseases [chiefly *Hemileia vastatrix, Corticium koleroga,* and die-back] confirmed the superiority of casein Bordeaux mixture over linseed oil Bordeaux and other fungicides [*R.A.M.*, xiii, pp. 229, 695]. The plants which received one spray application only, in May, showed leaf counts per measured unit [ibid., xi, p. 41] of 2·65 and 2·76 at the end of the February following, as against 3·83 and 3·31 for those sprayed in May and September.

Continued investigations into coffee black bean confirmed the results previously obtained [ibid., xiii, p. 229] and again indicated that the condition is not of parasitic origin. Examination of spotted beans, large numbers of which were present in the 1933 crop, led to the conclusion that the spotting, which is confined to the endosperm, was of the same nature as black bean. Usually the spots are situated on the outer surface, but sometimes a second spot is present on the inner fold of the bean immediately beneath the outer spot. In relatively small spots the brown disorganized tissues appear as a mass of material forcing its way between the normal endosperm cells, which, however, are so arranged with respect to the disorganized tissue that they were evidently formed after a focus of activity had arisen in the place occupied by the latter; this enables the time of origin of the trouble to be ascertained. The spotting was not due to any organism, and is considered to be most probably a nutritive abnormality.

HARLAND (S. C.). **The work of the St. Vincent Cotton Station.**—*Empire Cotton Growing Review*, xi, 4, pp. 300–309, 1934.

After mentioning that in St. Vincent the annual rainfall amounts to over 100 in., the author states that in 1915 the low cotton yield in the island was due mainly to internal boll disease [*Nematospora* spp.] and angular leaf spot [*Bacterium malvacearum*: *R.A.M.*, xiii, p. 369]. Work on the selection of pure lines resistant to the latter was begun by selecting lines subject to attack latest in the season, and two very resistant lines, AB and AN, were obtained. Resistance does not depend on one or two genes, but probably on a complex of tiny genes which together produce a cumulative effect.

The cutting down of the wild food plants of the cotton stainer [*Dysdercus delauneyi*] immediately reduced the incidence of internal boll disease, the percentage of stained cotton falling from 25 per cent. in 1916–17 to 14·5 per cent. the following year; in 1922–3 the figure dropped to between 5 and 6 per cent. More recent work has led to the development of hybrid strains between Peruvian (*Gossypium barbadense*) and Sea Island cotton with promising results as regards resistance to angular leaf spot [loc. cit.].

Bailey (M. A.). **Leaf curl disease of Cotton in the Sudan.**—*Empire Cotton Growing Review*, xi, 4, pp. 280–288, 1934.

Cotton leaf curl [*R.A.M.*, xiii, p. 696], first observed in the Gezira (Sudan) in 1923–4, by 1930 attacked almost every plant in the whole area of some 200,000 acres.

Leaf curl symptoms were recently reported by R. E. Massey to have been found on Malvaceous weeds in the Nuba Mountains district in circumstances which did not suggest that infection had spread from cotton, so that it is possible that cotton has become infected from some similar indigenous source.

In 1931–2 the early rains were very light and leaf curl incidence dropped considerably, but in the following season, when the early rainfall was heavier than usual, widespread and severe attacks again supervened. A high percentage of the old cotton stumps of the previous crop survived, and were sprouting vigorously and thus carrying over infection when the new crop was in the ground. In 1933–4 the amount of this ratoon cotton was reduced enormously by the use of the uprooting tool designed by Massey [loc. cit.]. The disease spread slowly after its first appearance, diffusion being due, apparently, to local secondary infection from the parts of the new crop first infected rather than to further infection from outside sources; though wide areas were subsequently affected, the attack set in so late that it did relatively little damage since bolls that have been formed prior to infection appear to be uninjured. The Asiatic varieties remained almost completely immune, while the American ones showed moderate resistance.

Individual plant selection was carried out within the Sakel crop, among pedigree families of Sea Island cotton growing at Shambat, and among the progenies of earlier crosses between Sakel and Sea Island strains. In 1928–9 seed was collected from 170 separate plants, the progenies of which, however, showed little resistance. Some of the hybrids between Sea Island strains and Sakel produced the severest cases of leaf curl yet seen, whereas others were much more resistant than Sakel. Two plants from the progeny of a selection from ordinary Sakel cotton showed considerable resistance and gave two strains, X1530 and X1730, in which the relative immunity of the original sub-selections has been retained; in a small field trial the former showed 6 and the latter 8 per cent. infection, as against 44 and 74 per cent. for the Sakel control plots surrounding them. When the new strains were grown in plots remote from the susceptible controls, X1530, X1730, and X1030 showed, respectively, 3, 2, and 2 per cent. infection, as against 91·5 per cent. in the Sakel plots. In lint characters the first two of these strains agree closely with their Sakel prototype, but are outstanding in vigour and productiveness.

McNamara (H. C.), Wester (R. E.), & Gunn (K. C.). **Persistent strands of the Cotton root-rot fungus in Texas.**—*Journ. Agric. Res.*, xlix, 6, pp. 531–538, 6 pl., 1934.

This is the full report of the authors' discovery and study at Greenville, Texas, of the occurrence in the cotton root rot fungus (*Phymatotrichum omnivorum*) of persistent strands, a comprehensive summary

of which has already been noticed from another source [*R.A.M.*, xii, p. 628].

NEAL (D. C.), WESTER (R. E.), & GUNN (K. C.). **Morphology and life history of the Cotton root-rot fungus in Texas.**—*Journ. Agric. Res.*, xlix, 6, pp. 539–548, 11 pl., 1 fig., 1934.

A detailed account is given of the authors' study of the morphology of the *Ozonium* and sclerotial stages of *Phymatotrichum omnivorum*, and also of the life-history of the fungus under field conditions in Texas. A special comparative study was made of the structure of persistent strands [see preceding abstract] and of the sclerotia at various stages of their development, the results of which showed that while the central portion of some of the strands is well defined, comprising from one to three large, septate hyphae, other strands are entirely cellular and closely resemble true sclerotia in their structure. The histological study of mature and newly formed sclerotia obtained both from laboratory cultures and from the soil largely confirmed the work of previous authors.

The importance of the persistent strands in the overwintering and perpetuation of *P. omnivorum* in the soil of infected fields was clearly demonstrated by the fact that many of the strands collected from fallow plots, from fields planted to non-susceptible crops, and from soil cultures were found to be viable after long intervals of time, and special inoculation experiments showed such strands to be infective to susceptible hosts.

GHESQUIÈRE (J.). **Un entomophyte nouveau de la mouche blanche des serres.** [A new entomophyte on greenhouse whitefly.]—*Bull. Soc. Roy. Bot. de Belg.*, lxvii (Sér. II, xvii), 1, p. 96, 1934.

The author observed larvae and nymphs of the greenhouse whitefly (*Trialeurodes vaporarium*) in the tropical hothouses of the Botanical Gardens, Brussels, parasitized by *Torrubiella luteorostrata* [*R.A.M.*, iii, p. 212], stated to be the first European record of this species. The fungus is characterized by red, flask-shaped perithecia on a purple subiculum surrounded by a fine, white mycelial fringe.

HENDEE (ESTHER C.). **The rôle of fungi in the diet of termites.**—*Science*, N.S., lxxx, 2075, p. 316, 1934.

Termites (*Zootermopsis angusticollis*) fed on rotten, fungus-containing Monterey pine [*Pinus radiata* = *P. insignis*] and Douglas fir [*Pseudotsuga taxifolia*] wood in California made much more vigorous growth than those on a sound, fungus-free substratum of the same trees [*R.A.M.*, xiii, p. 509]. Moderately good growth was also made by the termites on Douglas fir superficially infected by *Trichoderma lignorum* and on Monterey pine bearing fungi introduced by the insects themselves. It is as yet uncertain whether the improved growth of the termites, which was clearly associated with the presence of fungi, was due to the superior nutritional qualities of the infected wood (fungi being a source of proteins), to the neutralization by the fungi of some toxic factor in the substratum, or to both conditions.

TROTTER (A.). **Il fungo-Ambrosia delle gallerie di un Xyleborino di Ceylon.** [The Ambrosia fungus of the galleries of a *Xyleborus* from Ceylon.]—*Ann. R. Ist. Sup. Agrar. di Portici*, Ser. III, vi, pp. 256–275, 6 figs., 1934.

In the galleries of a *Xyleborus* in the branches of living *Brownea grandiceps* sent to Italy from Ceylon the author observed two superimposed fungal layers. The lower one consisted of short chains of the subolivaceous, sterile, torulose, subglobose hyphae of an 'Ambrosia' type [cf. *R.A.M.*, xiii, p. 440] 8 to 12 μ in diameter, composed of two to four conidium-shaped segments (of which the terminal one was the thickest) forming a compact layer of chaplets. The upper layer consisted of a whitish mass of hyaline, variously shaped, continuous conidia ranging from 8 by 4 to 35 by 7·5 μ, or even larger; in this stage the fungus resembled morphologically a *Monilia*, though the elongated, subclavate, somewhat falcate conidia suggested affinity with the genus *Cylindrium* and the presence of a basal layer recalled *Cylindrocolla*, *Blennaria*, *Sirodochiella*, &c.

In hanging drop cultures at 21° C. the conidia germinated freely in six hours with the production of hyaline, non-septate germ-tubes producing a few moderately long branches at right angles. Prior to, or during, germination the conidia ordinarily became septate and turned yellow, only the smallest remaining continuous, while the others formed one to three slightly constricted septa and assumed a chlorine tinge. In this stage the organism had affinities with the genera *Septocylindrium*, *Fusoma*, &c., if considered as belonging to the Moniliaceae, or with *Discocolla* or *Fusarium* if regarded as one of the Tuberculariaceae. By reason of the olivaceous mycelium, the chaplets of olivaceous hyphae, and the chlorine tinge of the conidia it had some of the characters of the Dematiaceae.

When grown in pure culture new conidia were produced of the type observed in nature and, on the same mycelium, short branches with microconidia and also irregular, thickened, torulose hyphae sometimes in short chains, exactly resembling those of the Ambrosia in the galleries except that they were pale chlorine or subhyaline.

The author considers that the fungus belongs to an undescribed genus and names it *Ambrosiaemyces zeylanicus* n. gen., n. sp. with Latin diagnoses.

It is concluded that the same fungus in its conidial stage, or another species of the same genus, is probably present on European material. In the Ceylon material the conidia can disseminate the fungus during the emergence of the insect and reproduce the Ambrosia stage directly. Adult insects in boring new galleries act as vectors. The catenulate, conidium-shaped hyphae resemble those of certain Endomycetaceae from which, however, the fungus differs, as it does from all the other Gymnoascales, in its non-septate mycelium and the absence of asci.

NANNIZZI (A.). **Repertorio sistematico dei miceti dell'uomo e degli animali.** [A systematic repertory of human and animal fungi.]—*Trattato di Micopatologia Umana*, iv, xii+557 pp., 224 figs., Siena, S. A. Poligrafica Meini, 1934.

In this well-produced and valuable work of reference the author gives

a list, arranged in the order of their systematic position, of all the species of fungi, together with their synonyms and including the Actinomycetales, isolated clinically from human and animal diseases which he has been able to trace up to the end of 1932, as well as some recorded in the early part of 1933. A short description is given of the characters of each fungus in culture and of those of most of them *in situ*, classification being further facilitated by the illustrations and analytical keys. A bibliography of works of a general nature is included and there is an index of the genera and species mentioned.

This book is the fourth volume of the complete treatise which is to be published under the general editorship of Professor Pollacci, but in view of the fact that an up-to-date work of this nature has long been urgently needed, it has been issued before volumes I to III.

CATANEI (A.). **Recherches parasitologiques et expérimentales sur la sporotrichose, les blastomycoses et l'actinomycose, en Algérie.** [Parasitological and experimental researches on sporotrichosis, blastomycoses, and actinomycosis in Algeria.]—*Arch. Inst. Pasteur d'Algérie*, xii, 3, pp. 351–366, 1 pl., 3 figs., 1934.

Full details are given of the writer's studies in Algeria on the morphological, cultural, and pathogenic aspects of *Sporotrichum beurmanni* [*R.A.M.*, xiii, p. 770], isolated from the human leg; *S. biparasiticum* Bubák, 1906, from water [ibid., viii, p. 783]; the fungus isolated from blastomycotic lesions in the forearm, originally described as *Cryptococcus montpellieri* Cat. [ibid., xii, p. 288] but here transferred to *Candida* (*C. montpellieri*) in Langeron's and Talice's classification [ibid., xiii, p. 767; xiv, p. 101]; *Hormodendron algeriensis* n. sp., isolated from the leg and characterized by brown, septate, branched hyphae, averaging 4 μ in diameter; erect, pluriarticulate conidiophores bearing concatenate, ovoid or elongated conidia, 5·5 to 11 by 3 to 4 μ; forming dark green to blackish-brown colonies on Sabouraud's agar and carrot; and growing best at 37° C.; and three strains of *Cohnistreptothrix* [*Actinomyces*] *israeli*. *S. biparasiticum* proved to be virulently pathogenic to animals, while *Candida montpellieri* and *H. algeriensis* gave positive results on rabbits inoculated subcutaneously.

ROTTER (W.) & CHAVARRIA (A. P.). **Weitere Untersuchungen über Blastomykosen in Costa Rica.** [Further studies on blastomycoses in Costa Rica.]—*Arch. für Schiffs. u. Tropenhyg.*, xxxviii, 10, pp. 406–417, 11 figs., 1934.

From extensive, verrucose, partially cicatrized lesions on the arm and hand of a Costa Rican agricultural labourer affected by chromoblastomycosis the writers isolated a fungus with a thick, septate mycelium and conidiophores bearing spherical conidia. On serum round, yellow bodies developed in three weeks, identical with those found in the tissues. The organism was identified by Dr. Dodge of St. Louis as *Hormodendrum langeroni* Fonseca, Area Leão, and Penido [*R.A.M.*, x, p. 523]; it was only mildly pathogenic to laboratory animals.

Clinically, anatomically, and mycologically the fungus isolated from

a case of coccidioidal granuloma (believed to be the first in Central America) in a negro corresponded with *Paracoccidioides brasiliensis* [ibid., xiii, p. 579], the slow growth of which (25 days elapsed before the colonies were visible to the naked eye on Sabouraud's medium) differentiates it from *Coccidioides immitis* [ibid., xiv, p. 101]. In agreement with Almeida's observations, cysts were detected in various states—dividing, proliferating, and surrounded by a circle of small, round bodies.

The fungus isolated from a frontal lesion in a farm labourer was tentatively identified by Dr. Dodge as *Hemispora stellata* [ibid., xiii, p. 701]. It forms numerous biscuit-shaped, yeast-like bodies in culture. *Aspergillus unguis* Weill & Gaudin was considered by the same authority to be the agent of a case of onychomycosis. Other fungi implicated in the dermatomycoses of Costa Rica include *Sporotrichum*, *Microsporon* [*Malassezia*] *furfur*, *Achorion schoenleini*, *Trichophyton tonsurans*, *Microsporon felineum*, and *Gliocladium* sp.

McDonald (Cornelia). **A study of Coccidioides immitis.**—*Journ. Lab. & Clin. Med.*, xx, 1, pp. 47–53, 7 figs., 1934.

From the network of hyphae and spores obtained from a pharyngeal lesion in a male patient from Louisiana, suffering from coccidioidal granuloma (*Coccidioides immitis*) [see preceding abstract], raised white or occasional brown colonies developed on agar plates; they consisted of small, spore-like, Gram-positive, non-acid- and alcohol-fast bodies and branched, septate, vacuolate hyphae. Rapid and abundant growth was made on carbohydrate media, without acid or gas formation. Transferred to agar slants the aerial hyphae rapidly formed a cloudy, white growth. Culturally and microscopically the fungus showed all the characters first described in detail by Wolbach (*Journ. Med. Res.*, viii, p. 53, 1904). Conidia, usually abstricted from the hyphal tip, were observed in the older cultures, and chlamydospores as described by Ophüls (*Journ. Exper. Med.*, vi, p. 443, 1905) were found occasionally within the hyphae and bore a marked resemblance to the spherical bodies recovered from the sputum and detected in animal tissue.

The conversion of spherical bodies as found in the pus of the lesions into mycelium was studied in hanging drops, and the development from the former of a network of branched, septate hyphae, which became clubbed with advancing age and produced spores, was followed.

Brunetto (Stefania), Ciferri (R.), & Redaelli (P.). **Caratteri e posizione sistematica del genere Redaellia Cif.** [The characters and systematic position of the genus *Redaellia* Cif.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, v, pp. 125–143, 8 figs., 1934. [Latin and English summaries.]

A detailed study of the cultural and morphological characters of *Redaellia elegans* Cif. (the only species of this genus) showed that on solid media the fungus formed yellowish-white, glabrous, frequently cerebriform colonies, the larger ones resembling those of *Trichophyton*, while in Raulin's liquid numerous, minute, glabrous, arborescent, yellowish colonies formed at the bottom of the tube, where, in peptonized

water a compact, glabrous, honey-yellow layer developed. The hyphae ranged from 5 to 12 μ in diameter, and the spherical chlamydospores had a distinct double wall, were borne singly or in chains, and measured 7 to 30 μ in diameter. The conidia developed as true acrogenous, verticillate thallo-blastospores borne in short chains on small digitate processes arising from the swollen apex of the sporiferous hyphae, which were only formed under semi-anaerobic conditions.

The presence of the last-named organs shows that *R. elegans* is one of the more highly organized Mycotoruleae, though remote from other genera in the same sub-family. It approaches *Trichosporon* Vuillemin (or *Trichosporum* Behrend), the colonies of some species of which, such as *Parendomyces rugosus* (Cast.) Ota (=*Hemispora rugosa* or *T. rugosum*) [*R.A.M.*, v, p. 363] very closely resemble those of *R. elegans*.

This connexion between *Redaellia* and the group *Parendomyces-Trichosporon* is confirmed by the fact that the genus *Geotrichoides* was transferred by Ota and Kawatsuré to *Trichosporon* [ibid., xiii, p. 235]. More recently, Verona identified *Geotrichoides* with *Proteomyces* Moses et Vianna, which Ciferri placed among the Mycotoruleae. It is not, however, possible to refer *Redaellia* to the group *Proteomyces-Geotrichoides-Trichosporon-Parendomyces* owing to the peculiar formation of the blastospores and the absence of definite arthrospores in *Redaellia*.

In the light of the available information the genus *Redaellia* should be included in the Torulopsidaceae-Mycotoruleae, among the more highly organized genera forming a transition group between the Blastosporales and the Arthrosporales. A more definite identification is not possible until more is known of the fungi comprising the group *Parendomyces-Trichosporon*.

Inoculations of laboratory animals showed that under the experimental conditions *R. elegans* was only very weakly pathogenic.

Leão (A. E. de A.) & Lobo (J.). **Mycétome du pied à Cephalosporium recifei n. sp. Mycétome à grains blancs.** [A mycetoma of the foot due to *Cephalosporium recifei* n. sp. A mycetoma with white grains.] —*Comptes rendus Soc. de Biol.*, cxvii, 29, pp. 203–205, 1934.

Cephalosporium recifei n. sp., isolated from a mycetoma of the foot with yellowish-white grains in a Brazilian farmer, is characterized by white to canary-yellow colonies, septate hyphae, 2·5 μ in width, and erect conidiophores, 24 to 32 μ long, bearing at their apex smooth, hyaline, elliptical conidia, 2 μ in diameter. Gelatine is liquefied and milk coagulated. The optimum temperature for growth is 25° to 30° C.

Allen (Ruth F.). **Heterothallism in Flax rust.**—Abs. in *Phytopath.*, xxiv, 10, p. 1143, 1934.

When the spermatia of one sex of the heterothallic flax rust (*Melampsora lini*) [*R.A.M.*, xii, p. 632] are transferred to the surface of an infection of the opposite sex, they enter the leaf through epidermal cells or through spermogonia, and after a short period of growth in the leaf tissue pair with the hyphae in the aecidia to form the basal cells from which the aecidiospores arise.

SEVERIN (H. H. P.) & FREITAG (J. H.). **Ornamental flowering plants naturally infected with curly-top and Aster-yellows viruses.**—*Hilgardia*, viii, 8, pp. 233–262, 3 pl., 17 figs., 1934.

This paper on ornamental flowering plants naturally infected with curly top and aster yellows in California is an expanded version of one already noticed from another source [*R.A.M.*, xii, p. 446]. *Dianthus barbatus* is now omitted from the list of hosts harbouring the former disease, while *D. plumarius* and *Viola cornuta* are added to it. To the plants from which yellows was transferred to asters and celery by the leafhopper *Cicadula divisa* Uhl. [*C. sexnotata*] the following are now added: *Eschscholtzia californica* (Papaveraceae), *Godetia grandiflora* (Onagraceae), and, among the Compositae, *Tagetes erecta*.

SEVERIN (H. H. P.). **Weed host range and overwintering of curly-top virus.**—*Hilgardia*, viii, 8, pp. 263–280, 2 pl., 8 figs., 1934.

Fifty-seven species of weeds in 28 genera belonging to 16 families growing in cultivated and uncultivated parts of California were experimentally infected with curly top [see preceding abstract]. Naturally infected wild plants growing in uncultivated localities included 14 species in 13 genera belonging to 8 families. In the cultivated areas 26 species of weeds in 15 genera belonging to 9 families were naturally infected. The virus overwintered in 11 species of annual and 3 species of perennial wild plants in the uncultivated districts, while in the cultivated areas 4 species of perennial weeds and 3 species of weeds sometimes annual and sometimes perennial were naturally infected. Lists of all these plants are given. The economic plants which may enable the virus to overwinter and which were found to be naturally infected included lucerne, parsley, and potato. The virus seldom overwinters in male beet leafhoppers [*Eutettix tenella*], most of which die during the winter; the infective power is not retained during the adult life of the females unless they reinfect themselves during the winter.

WHITE (R. P.). **The effect of mosaic on bloom production of the Talisman Rose.**—*Phytopath.*, xxiv, 10, pp. 1124–1125, 1934.

During the two years' experiments under controlled conditions at the New Jersey Agricultural Experiment Station, 28 mosaic-free Talisman roses annually produced a total of 31·98 blooms per plant, with an average stem length of 10·77 in., the corresponding figures for diseased plants being 34·78 and 10·55 in., respectively [*R.A.M.*, xi, p. 374]. The percentages of imperfect blooms cut from healthy and diseased plants were 2·90 and 7·65, respectively. Expressed on a basis of the annual production of saleable blooms per plant, the healthy plants yielded 31·05 and the diseased 29·07, these figures denoting that the practical effect of the disease on the Talisman variety is very slight in contrast to the susceptible Madame Butterfly, the production of which may be reduced to less than a quarter of the normal.

JENKINS (ANNA E.). **Cryptosporium canker of Rose.**—*Plant Disease Reporter*, xviii, 12, p. 157, 1934. [Mimeographed.]

Cryptosporium minimum [*R.A.M.*, xii, p. 447] has recently been identified on rose stem cankers in Oregon and Pennsylvania, apparently

the first records of the occurrence of the fungus in the United States. On the Oregon material, consisting of old stems apparently weakened by the effects of abnormally low temperatures in the previous winter, cankers due to *Coryneum microstictum* [ibid., xiii, p. 288] were also present. The *Cryptosporium* cankers on the rose in Germany are described by Laubert (who verified the American identifications) in *Centralbl. für Bakt.*, Ab. 2, xix, p. 163, 1907, as ranging from $\frac{1}{4}$ to $1\frac{1}{2}$ cm. in diameter, at first black with purple borders, becoming lighter, and bearing white spore masses.

WALTER (MARTA). **Eine gefährliche Asternkrankheit.** [A dangerous Aster disease.]—*Ratschläge für Haus, Garten, Feld*, ix, 10, pp. 173–174, 1 fig., 1934.

A popular note is given on the *Fusarium* wilt of asters [*Callistephus chinensis*: *R.A.M.*, xiii, p. 704] in the Munich district, with directions for its control by appropriate cultural measures and seed and soil disinfection with 0·1 per cent. ceresan. The disease occurs through a temperature range of 4° to 32° C., reaching a climax round about 12°.

WHITE (H. E.). **Preliminary report on breeding rust resistant Snapdragons.**—*Proc. Amer. Soc. Hort. Sci. 1933*, xxx, pp. 589–590, 1934.

In breeding tests carried out in Massachusetts to develop snapdragon [*Antirrhinum majus*] strains resistant to rust [*Puccinia antirrhini*: *R.A.M.*, xiv, p. 12] it was found that the very resistant strains were commercially undesirable, producing irregularly shaped flower spikes with magenta flowers. An original resistant (magenta) strain was then crossed with commercial varieties, and this resulted in a segregation of colours in the ratio of two magenta (i.e., true magenta and all combinations with red) to one white (ivory) or yellow; selfed white or yellow plants segregated true for colour type in the F_1 and F_2 generations. White (ivory) was dominant over yellow. Inheritance of rust resistance in these crosses appeared also to be dominant. Segregation for rust reaction in the yellow- and ivory-flowered plants was three resistant to one susceptible. The homozygous individuals bred true for colour and resistance, while the heterozygous types segregated again into a 3:1 ratio. Resistance tended to stay with white and yellow, indicating a possible connexion between resistance and colour, a view supported by the fact that when pink, bronze, or red varieties were crossed with the original resistant magenta strain the resultant progeny were more susceptible than crosses with white or yellow varieties; further, selections for resistant pink strains were very difficult to obtain. Commercial varieties when crossed with each other were completely susceptible. Selected resistant strains withstood direct inoculations with rust.

TOMPKINS (C. M.). **Breaking in Stock (Matthiola incana), a virosis.**—Abs. in *Phytopath.*, xxiv, 10, p. 1137, 1934.

Annual stock (*Matthiola incana*) in the coastal areas of central California is subject to a systemic virus disease characterized by stunting of the plants and sectorial or complete 'breaking' of the flowers in the terminal racemes [cf. *R.A.M.*, xiii, p. 446], resulting in a bleached, blotched appearance of the undersized petals; there was also occasional

leaf mottling, and a reduction in the size of the seed pods. All varieties and colours seem to be susceptible to natural infection, especially American Beauty and Heatham Beauty in the Giant Imperial and Giant Perfection groups. Broken flowers are commercially valueless. Young, healthy Imperial Crimson seedlings were successfully infected to the extent of 60 per cent. by juice inoculations in the greenhouse at about 60° F., the incubation period ranging from five to seven weeks. The relation of this disease to a destructive cauliflower virus [see below, p. 207] and its mode of spread in the field remain to be determined.

GREEN (D. E.). **A leaf spot of Daphne mezereum new to Great Britain.** —*Gard. Chron.*, xcvi, 2496, p. 305, 2 figs. (1 on p. 304), 1934.

Daphne mezereum leaves examined by the writer in 1934 were found to bear raised, circular, light brown, necrotic spots, about 1 mm. across, produced by *Marssonina daphnes* [*R.A.M.*, xi, p. 109]. Defoliation results from spots developed in the narrow basal portion of the leaf. The waxy acervuli are formed below the epidermis which is ruptured to liberate hyaline, unequally bicellular, slightly falcate conidia, measuring 20 by 6 μ, which are disseminated by wind and rain. This is believed to be the first record of the fungus in Great Britain.

WHITE (R. P.). **Mercury ammonium silicate as a Gladiolus corm treatment.**—*Phytopath.*, xxiv, 10, pp. 1122–1124, 1934.

The writer tabulates and briefly discusses the results of tests at the New Jersey Agricultural Experiment Station on the efficacy of a mercury ammonium silicate dip (prepared by the action of a mercuric chloride solution on a mixture of ammonium hydroxide and sodium silicate) compared with the standard calomel [mercurous chloride] dip and seven hours' immersion in 1 in 1,000 mercuric chloride for the control of gladiolus scab [*Bacterium marginatum*: *R.A.M.*, xiii, p. 168] and *Penicillium gladioli* [ibid., x, p. 645]. Very encouraging results were given by the mercury ammonium silicate gel with a mercury concentration equal to that in the standard calomel formula, especially in 1933, when the compound was used in a less soluble form than in 1932. Applied at one-half the standard mercury concentration, the efficacy of the mercury ammonium silicate gel was markedly reduced in 1932 but not appreciably impaired in 1933.

The percentage of corms free from infection by *P. gladioli* was increased in 1932 from 18·9 to 49·7 and in 1933 from 43·4 to 69·7, these figures being much more satisfactory than those obtained with calomel in 1931.

KAVEN (G.). **Krankheiten und Schädlinge an Rhododendren.** [*Rhododendron* diseases and pests.]—*Die Kranke Pflanze*, xi, 10, pp. 123–126, 1934.

The 'collapse' of young rhododendrons associated with infection by *Phytophthora cactorum* [*R.A.M.*, xii, p. 696] in Germany is stated to be preventable by immersion in a 0·25 per cent. uspulun solution. More serious are the leaf spots of older plants caused by species of *Phoma*, *Gloeosporium*, *Pleospora*, *Phacidium*, and *Pestalozzia* [ibid., xi, p. 650], which are not only disfiguring but induce premature defoliation. All

these organisms may be controlled by thorough sanitation coupled with the application of a standard fungicide, e.g., Burgundy mixture or ammoniacal copper carbonate (0·5 to 2 per cent.). Similar measures may be used against *Phyllosticta cunninghami* and *Diplodia rhododendri* [ibid., x, p. 798], the sole external signs of which are their minute fructifications on the leaves. *Chrysomyxa rhododendri*, the alternate stage of which is formed on spruce [*Picea excelsa*: ibid., xiii, p. 201], can persist in the absence of the latter under greenhouse conditions. *Exobasidium rhododendri* [*E. vaccinii*: ibid., xii, pp. 399, 696] produces white or reddish-tinted galls on leaves and shoot tips. Destruction of diseased material is indicated in the two last-named cases.

Brown (Nellie A.). **A fungus gall on Viburnum mistaken for crown gall.**—*Phytopath.*, xxiv, 10, pp. 1119–1120, 1 fig., 1934.

The writer has had under observation at intervals since 1923 a disease resembling crown gall (*Bacterium tumefaciens*) on *Viburnum opulus* from a public park in New York State. Galls measuring ¼ to 1 in. or more in diameter occurred at or near the nodes of the stem, which was usually encircled. The bacterium could not be isolated from the diseased material which, however, yielded a *Phomopsis* shown in 1934, as a result of positive inoculation experiments on *V. tomentosum*, to be the cause of the disease. Since the organism enters the host through wounds, it seems probable that a mite or aphid may assist in the process of gall formation.

Yarwood (C. E.). **Effect of mildew and rust infection on dry weight and respiration of excised Clover leaflets.**—*Journ. Agric. Res.*, xlix, 6, pp. 549–558, 1 fig., 3 graphs, 1934.

Under the experimental conditions fully described in this paper, infection of excised red clover (*Trifolium pratense*) leaflets floated on sucrose nutrient solutions with mildew (*Erysiphe polygoni*) was shown to cause an average decrease of 9 per cent. in the dry weight of the leaflets during a 12-day period, while infection with rust (*Uromyces fallens*) caused an average increase of 10 per cent. [cf. *R.A.M.*, xiii, p. 773]. During a 9- to 11-day period after inoculation, the respiration of the leaflets was increased by an average of 41 per cent. by the mildew and of 123 per cent. by the rust. The rate of respiration of rust-infected leaflets was greater in aerated culture flasks than in flasks in which the respiratory gases were allowed to accumulate, and dusting the leaflets with sulphur increased the respiration of both healthy and mildew-infected leaflets.

A brief discussion is given of the influence which may be exerted on the changes in dry weight of the leaflets by the differences in the extent of invasion of the leaf tissues by the mildew and rust fungi, respectively.

Brink (R. A.), Jones (F. R.), & Albrecht (H. R.). **Genetics of resistance to bacterial wilt in Alfalfa.**—*Journ. Agric. Res.*, xlix, 7, pp. 635–642, 2 graphs, 1934.

The results of preliminary studies in 1933, some of which have been noticed from another source [see above, p. 149], of the inheritance in lucerne of resistance to bacterial wilt (*Phytomonas insidiosa*) [*Aplano-*

bacter insidiosum: *R.A.M.*, xiii, p. 774] indicated that resistance behaves as an intergrading character and probably depends on a complex of genetic factors, an interpretation of which is not possible at present. The widely divergent proportions of resistant and susceptible F_2 individuals obtained by selfing wilt-resistant and susceptible plants would show that the composition of the parents may differ markedly in respect to the genes that govern their reaction to infection. The behaviour of 95 once-selfed families of the Hardistan variety suggested that there may be a slight inverse correlation between seed production and wilt resistance, but the evidence for this was by no means conclusive. There appeared to be no relationship between resistance and the morphology or winter-hardiness of the varieties tested.

CORMACK (M. W.). **On the invasion of roots of Medicago and Melilotus by Sclerotinia sp. and Plenodomus meliloti D. and S.**—*Canadian Journ. of Res.*, xi, 4, pp. 474–480, 1 pl., 1934.

A study was made of the invasion of lucerne and sweet clover (*Melilotus*) [*alba* and *officinalis*] roots by *Sclerotinia* sp. and *Plenodomus meliloti* [*R.A.M.*, xii, p. 635] in Alberta, with particular reference to the efficacy of wound cork in arresting the progress of these destructive pathogens.

The tests were carried out in the greenhouse and field on four varieties of lucerne (Grimm, Cossack, Baltic, and Liscombe) and four of sweet clover (White and Yellow Blossom, Arctic, and Maccor), differing in their capacity to withstand winter injury. Both the fungi used as inoculum were isolated from *Melilotus* roots on an oat hull medium. The *Sclerotinia* is thought by Dr. H. H. Whetzel to be possibly an undescribed species allied to *S. minor* [ibid., xiii, p. 241]. Both parasites proved capable of penetrating the uninjured external cork covering of the roots and any wound cork layers subsequently formed. The growing hyphae accumulated in close contact with the root and gradually ruptured the protective suberin layer prior to invading and killing the underlying tissues. A complete layer of wound cork seldom formed around the invaded area and what did form offered little resistance to invasion. With *P. meliloti* wound cork often did not form at all. The fact that tissue disorganization and suppression of wound cork formation occur in advance of hyphal permeation suggests that enzymatic activity may participate in these processes. No explanation is at present available of the arrest in the development of *P. meliloti* and the definite retardation in that of *S.* sp. after the commencement of vigorous growth in the plants during the spring.

HEADLEE (T. J.), MARTIN (W. H.), & FARLEY (A. J.). **Spraying recommendations for Apples. Spray schedule for Grapes. Spray schedule for Peaches. Spray schedule for Pears.**—*New Jersey Agric. Exper. Stat. Extens. Bulls.* 113, 115, 116, 117, 12 pp., 1934.

Directions are given in popular terms for the systematic application of standard sprays against some well-known fungous diseases and insect pests attacking apples, grapes, peaches, and pears in New Jersey [cf. *R.A.M.*, x, pp. 36, 39, 40, 75].

CHANDLER (W. H.), HOAGLAND (D. R.), & HIBBARD (P. L.). **Little-leaf or rosette of fruit trees, III.**—*Proc. Amer. Soc. Hort. Sci. 1933*, xxx, pp. 70–86, 1934.

Further investigations conducted by the authors in California into the control of little leaf of fruit trees [*R.A.M.*, xiii, p. 39; xiv, p. 42] are described and discussed in considerable detail.

On peaches and apricots and to a less extent on plums, almonds, and apples autumn spraying with zinc-lime at concentrations not less than 16–6–100 tended to cause the production during the following spring of shoots bearing normal leaves from buds that if unsprayed would have given tufts of little leaves. On trees bearing mottled leaves in the summer growth one autumn spraying improved the setting of the fruit, while with apricots and early peaches it allowed the fruit to develop normally.

Spraying peaches and apricots in spring, when the little leaf symptoms are most pronounced, with zinc-lime at concentrations not under 10–5–100 improved the development of the fruit that set, but on peaches did not effect this early enough to cause more fruit to set. On very badly affected peaches freedom from leaf mottling continued later in summer after one spring than after one autumn application.

One annual application soon after growth started of zinc-lime 10–5–100 kept grape vines free from little leaf; applied at any time during summer zinc penetrated the leaves and was beneficial to the vines.

Injecting zinc sulphate into holes in the trunk and branches [ibid., xiii, p. 40] gave better results than any other method on deciduous trees, uniformly early and striking effects being obtained on walnuts, apples, and apricots, though the authors consider that injury may eventually result from the killing of the sapwood involved. The holes should be made at intervals of 3 or 4 in. When one branch is treated in this way the disease is cured on all the branchlets above the holes, while small laterals even 1 ft. below may be benefited. Evidence of improvement was obtained by introducing zinc dust and zinc oxide into holes bored in peach trunks; no injury was caused to the tissues round the holes filled with zinc oxide.

Practically all the observations made in 1933 supported the view that little leaf is a symptom of zinc deficiency affecting normal metabolism [loc. cit.], but in view of the facts that a vigorous, healthy tree may suddenly die without warning, that some trees recover without any increase in the zinc supply, and that in certain soils large woody perennials are generally susceptible while annuals remain unaffected, the authors are not convinced that the disease is due to zinc deficiency alone.

THOMAS (HAROLD E.), HANSEN (H. N.), & THOMAS (H. EARL). **Dematophora root rot.**—Abs. in *Phytopath.*, xxiv, 10, p. 1145, 1934.

The root rot caused by *Dematophora* [*Rosellinia*] *necatrix* is stated to have been responsible during the past five years for much damage to apple orchards in Santa Cruz County, California [cf. *R.A.M.*, vi, p. 560], and has also been found in at least one apricot orchard in

Alameda County [ibid., v, p. 305]. The pathogenicity of the fungus has been demonstrated on small apple and pear trees. The disease may be distinguished from those due to *Armillaria* [*mellea*] and *Xylaria* [*polymorpha*: ibid., xii, p. 100] by the absence of well-defined rhizomorphs and the presence of profuse, white, cottony mycelium adjacent to affected roots in moist air in the laboratory or in soil cavities in the orchard. Coremia of *R. necatrix* are occasionally found near the ground line on trees killed by the rot, besides being usually formed in pure cultures of the organism on steamed wheat or oats kernels.

Koch (L. W.). **Investigations on black knot of Plums and Cherries. II. The occurrence and significance of certain fungi found in association with Dibotryon morbosum (Sch.) T. & S.**—*Scient. Agric.*, xv, 2, pp. 80–95, 3 pl., 1934. [French summary.]

The results of the field observations and laboratory experiments reported in this paper showed that the black knot fungus (*Dibotryon morbosum*) is not genetically connected with any of the imperfect fungi which are frequently found in association with it in nature [*R.A.M.*, xiv, p. 44]. The work also gave clear evidence that *Cephalothecium* (*Trichothecium*) *roseum*, which consistently appears every year in July and August on black knots, actively parasitizes the stroma of *D. morbosum* and exerts an important biological control of the latter by reducing the number of mature perithecia which are formed. Over a period of four years the *Coniothyrium* sp. [loc. cit.] was freely isolated from all the black knots investigated, except those in their earliest stage of development, and also at all times of the year from the bark and buds of apparently healthy plums, cherries, peaches, apples, and pears. It is characterized by dark olivaceous (but inky-black in mass), mostly ovoid, but varying from short cylindrical to piriform pycnospores, 3·8 to 7·6 by 2·8 to 3·8 μ in diameter. In inoculation experiments it was shown to cause slight swellings but not typical knots on wounded plum and cherry branches. Further tests showed that during the later stages in the development of the knots in nature it produces an abundance of pycnidia around and inside both immature and mature perithecia of *D. morbosum*, with which it is not, however, genetically connected. When grown together in pure culture, the two fungi exhibited a mutual tolerance.

Fikry (A.). **Water-table effects. I. The gumming and death of Plum trees.**—*Min. of Agric. Egypt, Tech. & Sci. Service* (*Mycol. Sect.*) *Bull.* 141, 35 pp., 12 pl., 3 figs., 7 graphs, 1934.

In an investigation into a physiological disease of plum trees in Egypt marked by a gum exudation from the fruits, stems, and trunks followed by a drying-up of the branches and finally by the death of the trees, of the four rootstocks tested Mariana and Myrobolan were, respectively, 84 and 58 per cent. resistant, while apricot and peach were very susceptible [*R.A.M.*, xii, p. 749]. The most resistant scion varieties tested on the four stocks collectively were America, Japanese Gold Climax, and Mariana; Bokra, Myrobolan, and Excelsior were moderately resistant, and Wickson very susceptible. The Mariana rootstock is

shallow-rooting, while Myrobolan and apricot are comparatively deep-rooting.

From a correlation established between the incidence of the disease and the height of the water in wells bored in the plantation (trees round wells where the water was 70 cm. below soil surface on 10th September, 1931, being relatively much less resistant than others round wells where on the same date the water was 100 to 110 cm. below soil level) it is concluded that the condition is directly due to a high subsoil water-table during the Nile rise. If the orchard is on low-lying land the use of deeply-rooting stocks indirectly favours the disease. Trees on sandy soil were less severely and much less generally affected than those on clay soils.

Control lies in the provision of deep drainage in orchards that are already affected and in the use of resistant varieties worked on Mariana stock in new ones. The site should be as high as possible and the sub-soil water-table not higher than 100 to 125 cm. below soil surface when the Nile flood reaches its maximum.

Dunegan (J. C.). **A disease of the English Morello Cherry caused by Bacterium pruni.**—*Journ. Agric. Res.*, xlix, 8, pp. 745–754, 4 figs., 1934.

The author's inoculation experiments and cultural studies of a bacterium isolated from 1931 to 1933 from diseased leaves and fruits of the Morello cherry (*Prunus cerasus*) received from Arkansas, Iowa, and Missouri, showed that it was identical with *Bacterium pruni* [*R.A.M.*, xiii, p. 172]. In the field the spots on the cherry leaves are similar in appearance to those caused by the organism on peach and plum leaves. On immature fruits they are circular, 0·5 mm. or less in diameter, and of a deeper green colour than normal; they gradually enlarge, and by the time they attain a breadth of 2 mm. their centre becomes sunken and is surrounded by an irregular, apparently water-soaked margin. The cherries appeared to be infected most commonly on their lower half. In some seasons the mature fruit is characteristically distorted by the production of slab-sided, flattened, or even triangular cherries, a feature which has not been seen in peaches or plums infected by *Bact. pruni*. In the cherries, furthermore, the bacteria were shown to be present in the tissues from the epidermis to the stone, and eventually to cause the complete destruction of all the cells in the invaded region.

The organism was also isolated from Morello twig cankers, in which it presumably overwinters to cause new infections the following spring, the outbreak of which is dependent on environmental conditions, and more particularly on rain. Secondary infections on the leaves, fruit stalks, and twigs may occur throughout the growing season; these infections are rather common on the small green cherries, but were observed only occasionally after the fruits turn red and begin to mature.

The disease is believed to be widespread in all the fruit-growing States east of the Rocky Mountains on the Morello and other varieties of cultivated cherries, failure to recognize it hitherto as a distinct disease being attributed to the similarity of the leaf spot caused by *Bact. pruni* to those produced by *Coccomyces hiemalis* [see above, p. 150], and to

the unusual symptoms on the mature cherries. The economic significance of the trouble is briefly discussed.

WILSON (E. E.). **A case of Almond blossom infection by Coryneum beijerinckii furnishing inoculum the following year.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1143–1144, 1934.

Coryneum beijerinckii [*Clasterosporium carpophilum*] is usually supposed to overwinter mainly in twig lesions, but in the spring of 1934 it was found [in California] sporulating on mummied almond blossoms blighted in the previous year [*R.A.M.*, ix, p. 766]. In 1934 the fungus also attacked the calyces during anthesis, the lesions in a few cases spreading downwards to the pedicel and blighting the blossom. From the calyx lesions the conidia may later spread to the young fruit and leaves. Even after abscission from the receptacle the calyces were observed to adhere to the developing fruits, on which numerous lesions were formed.

CHAMBERLAIN (E. E.). **A virus disease of Strawberries in New Zealand.** —*New Zealand Journ. of Agric.*, xlix, 4, pp. 226–231, 3 figs., 1934.

A brief account is given of a disease of strawberries, which is stated to be widespread and of increasing prevalence in New Zealand, diseased plants having been received from the Auckland, Poverty Bay, Nelson, Canterbury, and Otago districts. The symptoms agree closely with those of 'xanthosis' as described by Plakidas and of 'yellow edge' as described by Harris [*R.A.M.*, xiii, pp. 314, 784]. In controlled experiments in 1931 and 1934, the disease was transmitted to healthy plants (three out of ten in 1931 and three out of eight in 1934) by colonizing them with the aphid *Capitophorus fragariae* [ibid., xiii, p. 642] bred on diseased strawberry plants, all the controls remaining healthy; the first characteristic symptoms appeared in four months after inoculation in 1931 and in three months in 1934. Attempts to transmit the disease by rubbing the leaves of healthy plants with muslin moistened with juice from diseased leaves gave negative results.

The virus was shown to be transmitted from the mother plant to the runners, which, however, do not immediately develop the symptoms and may be set out as healthy plants, this being apparently the chief way in which the trouble is spread. Further dissemination is effected by *C. fragariae*, which is prevalent throughout New Zealand on the strawberry. The only effective means of controlling the disease is the use of planting material produced in an area far removed from strawberry-growing localities; it is also necessary to destroy all infected plants and their runners as soon as they appear in the nurseries and fruiting beds.

BERKELEY (G. H.) & LAUDER-THOMSON (ISABEL). **Root rots of Strawberry in Britain. The 'black lesion' type of Strawberry root rot.**—*Journ. Pomol. and Hort. Science*, xii, 3, pp. 222–246, 5 pl., 1 fig., 1934.

As a result of the investigations and inoculation studies reported in this paper, the authors state that five species of fungi among the numerous species isolated from strawberry roots affected with the 'black

lesion' type of rot in England [*R.A.M.*, xiii, p. 712] were found to be capable of parasitizing strawberry roots, namely, *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: ibid., xiv, p. 12], *Hainesia lythri* [ibid., xi, p. 252], *Cylindrocarpon radicicola* [cf. ibid., xii, p. 224], *Fusarium orthoceras*, and *Pachybasium candidum* Sacc. All five fungi may occur either singly or in association in the field [ibid., xiii, p. 785]; they cause very similar, if not identical symptoms, including dwarfing and stunting of leaves and petioles, and drying and browning of the lower leaves, resulting in a flat type of plant, with subsequent death of severely diseased plants. Affected roots are noticeably deficient in fibre, and exhibit distinct black lesions on the white to yellowish-brown roots. In the spring the first symptoms are apparent on roots formed the previous autumn, followed later by attack on the roots formed in the current season. An attempt on the part of the host to slough off the parasite is indicated by the laying down of cork cells in affected areas.

The disease associated with these fungi is widely distributed in Europe and America, and appears to be distinct from the Lanarkshire 'red core' disease [ibid., xiii, p. 784] associated with a species of *Phytophthora*; it is believed to play a major part in the general degeneration of the strawberry. There was evidence that the 'yellow edge' disease [see preceding abstract], in its first season at least, has no detrimental effect on the root system of the strawberry. So far the only control measures feasible, apart from the possible use of resistant varieties, are crop rotation and the use in planting of runners selected from healthy plants.

Roberts (R. H.). **Strawberry 'black root' injury.**—*Proc. Amer. Soc. Hort. Sci. 1933*, xxx, pp. 295–296, 1 fig., 1934.

Strawberry plants growing in Wisconsin sometimes develop during spring a discoloration of the roots and the interior of the crown [*R.A.M.*, vii, p. 727] apparently induced by cold weather in late autumn. When mulching from early October to 1st December, 1932, was carried out at times corresponding with drops in the temperature, the plants mulched before the temperature fell to 20° F. remained uninjured, though the percentage of discoloured roots found after a temperature of 7° on 19th November on large, medium, small, and very young unmulched Dunlap plants was 3·6, 13·6, 50·6, and 94·8 per cent., respectively. Many of the roots were discoloured internally only. The Premier variety sustained more injury than the Dunlap, probably owing to the inadequate protection afforded by the thin habit of the former. In 1933, traces of injury became apparent after 10th November, when the temperature fell to 17° and marked injury resulted on 15th November, after a drop to 6°; plants mulched before the temperature fell to 20° again remained unaffected. No fungus or bacterium appeared to be consistently associated with the condition.

Zundel (G. L.). **Raspberry diseases.**—*Pennsylvania Agric. Exper. Stat. Circ.* 133 (revised), 20 pp., 12 figs., 1934.

Brief, practical notes are given on the symptoms and control of the following diseases of raspberries in the United States: crown gall (*Bacterium tumefaciens*) [*R.A.M.*, xi, p. 428; xiii, p. 786], cane gall

[ibid., ix, p. 395], hairy root [*Bact. rhizogenes*], anthracnose (*Plectodiscella* [*Elsinoe*] *veneta*) [ibid., xiii, p. 358], *Septoria* leaf spot (*Mycosphaerella rubi*), spur blight (*M. rubina*) [*Didymella applanata*: ibid., x, p. 531], cane blight (*Leptosphaeria coniothyrium*) [ibid., xiii, p. 359], powdery mildew (*Sphaerotheca humuli*) [ibid., xii, p. 678], *Verticillium* wilt (*V. ovatum*) [ibid., x, p. 393], orange rust (*Gymnoconia interstitialis*) [ibid., xii, p. 104], red and yellow mosaics [ibid., xii, p. 770; xiii, p. 357], so-called 'speck' mosaic, apparently induced by cold on the leaves of black varieties [*Rubus occidentalis*], leaf curl (alpha and beta types) [ibid., x, pp. 195, 530], and mild and severe streak [ibid., xii, p. 230].

HAENSELER (C. M.). **Control of Dewberry anthracnose by spraying.**—*New Jersey Agric. Exper. Stat. Bull.* 574, 12 pp., 1 fig., 1934.

The results of four years' experiments [the results of which are discussed and tabulated] in the control of dewberry [*Rubus* spp.] anthracnose [*Elsinoe veneta*: *R.A.M.*, xi, pp. 626, 662] in New Jersey have led to the recommendation of the following spraying schedule: (1) delayed dormant application of concentrated lime-sulphur 1 in 20 (1 in 10 if rose scale [*Diaspis rosae*] is also severe) when the leaf buds are $\frac{1}{4}$ to $\frac{1}{2}$ in. long; (2) 50–10–100 Bordeaux mixture about seven days before blossoming. This treatment resulted in increased yields of 39 and 33 per cent. over the unsprayed controls in 1931 and 1932, respectively.

STELL (F.). **Banana growing and associated diseases.**—*Proc. Agric. Soc. Trinidad and Tobago*, xxxv, 9, pp. 357–368, 1934.

In this paper, read before the Trinidad Agricultural Society, the author briefly discusses the requisite conditions for successful banana cultivation and points out that the proposed plantation of Gros Michel on the cacao estates in Trinidad appears to be scarcely justifiable on any other grounds than the depressed state of the cacao industry, as the extent to which the cacao fields are infected by Panama disease (*Fusarium* [*oxysporum*] *cubense*) is not known but is probably considerable. Notes are given on this disease, as well as on 'moko' (*Bacterium*) [*solanacearum*: *R.A.M.*, xiii, p. 713] and borer (*Cosmopolites sordidus*), and their control, and the paper terminates with recommendations on field sanitation, the avoidance of bruising the fruit, and the selection of planting material.

JOHANSSON (N.). **A contribution to the knowledge of the etiology of fruitlet black rot disease of Pineapple.**—*Svensk Bot. Tidskr.*, xxviii, 3, pp. 384–404, 1 fig., 6 graphs, 1934.

A full account is given of the writer's studies and experiments in Guatemala in connexion with the fruitlet black rot disease of pineapple [*R.A.M.*, xi, p. 473], also known as 'fruitlet brown rot', 'fruitlet core rot', and 'black heart', which is stated to occur in the West Indies, Haiti [ibid., v, p. 538], Central America, Queensland [ibid., viii, p. 53], and the Philippines [ibid., vii, p. 794].

The writer's observations on the symptoms of the disease generally confirm those described by Barker from Haiti and Serrano from the Philippines, though the discoloration of the fruit reported by the latter worker has only been noted in cases of very severe infection. The

attribution of the rot by these investigators to *Bacillus ananas* is also accepted by the writer.

Experiments are described which were conducted in 1928 on Smooth Cayenne pineapples in the cultures of the Guatemala Plantations Ltd., showing the relation of the disease to the incidence of rainfall during flowering. The pathogen would appear to enter the fruit through the newly opened flowers, since the fruits developing from inflorescences with all the flowers remaining closed were always found to be quite sound, despite heavy rains. In general, the basal eyelets of a fruit are the most liable to attack, the entrance of their flowers presumably forming a convenient target for splashing raindrops which may collect round them in small pools. The risk of infection from this source is greatest during the first days of flowering. Fruits subsequently matured in isolation bags of parchment paper were usually found to be more severely infected than those not so treated. Spraying with mercuric chloride, potassium permanganate, or formaldehyde, and dusting with flowers of sulphur did not noticeably reduce the percentage of diseased fruits but served to some extent to prevent the spread of infection.

WARDLAW (C. W.), LEONARD (E. R.), & BAKER (R. E. D.). **Observations on the storage of various fruits and vegetables. I. Tomatoes, Cauliflowers, String Beans, Egg-plant, Cucumbers, and Musk-melons. II. Papaws, Pineapples, Granadillas, Grapefruit, and Oranges.**—*Trop. Agriculture*, xi, 8, pp. 196–200; 9, pp. 230–235, 2 graphs, 1934.

Continued trials at the Low Temperature Station, Trinidad, showed that fairly wide variations in manurial treatment have no marked influence on the keeping quality of the locally grown tomatoes, provided the fruit is picked green and free from damage, and also confirmed that fungal wastage during and after storage is almost exclusively due to *Phoma destructiva* [*R.A.M.*, xii, p. 794]. Among the other vegetables tested, cucumbers stored at 45°, 50°, and 60° F. all showed after the 30th day considerable wastage, the more serious types of which were caused by *Colletotrichum lagenarium*, *Fusarium* spp. including *F. succisae*, *Mycosphaerella citrullina* [ibid., x, p. 771], *Cladosporium cucumerinum* [ibid., xii, p. 485], and *Macrosporium cucumerinum* [*Alternaria cucumerina*: ibid., xi, p. 557].

Perhaps the most common cause of storage wastage in papaws is stated to be a species of *Gloeosporium* with typically elongated, cylindrical conidia with rounded ends (occasionally slightly concave and pointed at one extremity), measuring 16 to 20 by 4 to 6μ. Occasionally this fruit is also attacked by *Phomopsis papayae* [ibid., v, p. 189] and by *Fusarium dimerum* var. *pusillum* Wr. No fungal wastage during storage was observed in granadilla (*Passiflora macrocarpa*) fruits except for small spots caused by an undetermined fungus (?*Phleospora* or *Septoria* sp.) which is present on the fruits while still on the vines. The commonest cause of storage wastage in grapefruit is stated to be blue mould (*Penicillium italicum*), but some loss in the trials was also caused by green mould (*P. digitatum*) either alone or in association with the former. *Phomopsis* [*Diaporthe*] *citri* [see above, p. 161] was also observed causing a pliable, leathery, brown rot on the grapefruit surface, and

a soft rot of over-ripe or fallen fruits was caused by *Colletotrichum gloeosporioides* [ibid., xiii, p. 693].

Hoffman (M. B.). **Carbon dioxide assimilation by Apple leaves as affected by lime-sulphur sprays. II. Field experiments.**—*Proc. Amer. Soc. Hort. Sci. 1933*, xxx, pp. 169–175, 1934.

Orchard experiments [which are described, and the results of which are tabulated] to ascertain the effect of lime-sulphur spraying on the carbon dioxide utilization of apple leaves, ordinary summer strength lime-sulphur ($2\frac{1}{2}$ in 100 galls.) being applied by means of a small atomizer to both surfaces of the leaves, in general confirmed the results obtained in previous tests in the greenhouse [*R.A.M.*, xiii, p. 34].

One leaf sprayed on a sunny afternoon when the temperature was 29° C. next day showed a reduction of 41 per cent. in its assimilation of carbon dioxide, as compared with a loss of only 5 per cent. efficiency in an untreated leaf on an adjoining twig of the same tree. Although the maximum reduction in assimilation attributable to spraying occurs on the day after treatment, the reduction shown by the sprayed leaf continued in an appreciable and consistent amount for seven days, after which the observations were discontinued. Practically the same results were obtained with two other sprayed and unsprayed leaves.

When three leaves on two comparable trees were sprayed at 1.40 p.m. (temperature 21·5°) and three others on the same trees at 6.45 p.m. (temperature 16°) on the same day, all six showed reduced carbon dioxide assimilation during the next three days, but the reduction was greater in the leaves sprayed at the higher temperature.

New Jersey [sulphur-lime] dry-mix [ibid., v, p. 311] caused less reduction in efficiency of assimilation than lime-sulphur spray, the data obtained suggesting a difference in the effects of the mixtures on photosynthesis.

Copper emulsion.—*Trop. Agriculturist*, lxxxiii, 4, pp. 255–256, 1934.

The method for the preparation of 4 galls. of copper emulsion [*R.A.M.*, xiii, p. 332] recommended in this brief note is to dissolve separately 13 oz. of soft soap and $2\frac{1}{2}$ oz. of finely powdered copper sulphate crystals each in 2 galls. of soft water, and then to pour the copper sulphate solution into the soft soap one, at the same time stirring the latter constantly. Care should be exercised in weighing the two ingredients accurately, since excess of copper sulphate results in the formation of a sticky, green precipitate which spoils the emulsion, and excess of soap causes spray injury to the plants. The green precipitate is also produced if the soap solution is poured into the copper sulphate one. If properly prepared, the copper emulsion should be a thin, even, opaque liquid of a pale turquoise-blue.

This preparation is stated to be a cheap and efficient substitute for Bordeaux mixture which, owing to the difficulty of obtaining good lime, is hard to prepare satisfactorily in Ceylon.

Buller (A. H. R.). **Researches on fungi. Volume VI.**—xii+513 pp., 231 figs., London, Longmans, Green & Co., 1934.

The present volume of the author's well-known Researches on Fungi

[cf. *R.A.M.*, xii, p. 776] makes contributions to the knowledge of certain Phycomycetes, Ascomycetes, and Basidiomycetes.

Part I, comprising four chapters, deals with the biology and taxonomy of *Pilobolus*, the ocellus function of the subsporangial swelling in which is discussed in detail. A new species, *P. umbonatus*, is fully described with English and Latin diagnoses, while the final chapter of this section, a systematic account and arrangement of the Pilobolidae, is contributed by W. B. Grove.

The three chapters of Part II relate to spore production and liberation in the Discomycetes.

In Part III, also containing three chapters, the function of pseudorhizae and 'gemmifers' in the life-histories of certain Hymenomycetes is discussed. Gemmifers, as found in *Omphalia flavida*, the agent of the western coffee leaf disease [ibid., xii, p. 168], in which they have hitherto been misnamed '*Stilbum*-bodies', consist of a slender, solid, tapering pedicel about 2 mm. long and of a terminal, detachable, multicellular, knob-shaped gemma, approximately 0·36 mm. in diameter. The periphery of the upper (oblate-spheroid) part of the gemma is covered with aerial radiating filaments, termed by the author 'infection hyphae', which can penetrate and infect a new host leaf when a gemma has fallen upon it. From a comparison of the external form and internal structure of a gemmifer and of a sporophore of *O. flavida*, it may be inferred that a gemmifer is a highly specialized sporophore in which the pedicel and gemma are homologous with the stipe and pileus, respectively. The actual sporophores in this fungus are much larger than the gemmifers, being 0·6 to 1·5 cm. in height with a pileus 1·5 to 2·5 mm. in diameter. The abscission of a gemma of *O. flavida* from the end of its pedicel, preparatory to detachment by the wind, takes place while the apophysis of the gemma firmly clasps the pedicel subterminally, and is effected by the development of a sigmoid curve at the end of the stipe, which thus withdraws itself from the gemma. When a gemma falls on to a leaf, it usually settles on its slightly concave upper surface, from which, under moist conditions, the above-mentioned infection hyphae resume growth and invade the foliar tissues of suitable hosts. In a damp atmosphere detached gemmae of *O. flavida* retain their viability for over 24 hours, but they rapidly succumb to desiccation. On inoculation with *O. flavida* gemmae, wounded and unwounded leaves of *Bryophyllum calycinum* and uninjured, isolated leaves of *Nerium oleander* and *Ficus* sp. developed lesions successively giving rise to gemmifers and sporophores of the fungus. On the other hand, isolated leaves of *Plumbago capensis*, similarly treated, developed spots producing gemmifers only. A list is given of the plants, belonging to widely separated families of phanerogams, susceptible to infection by *O. flavida*, which is also pathogenic to ferns. Gemmifer production in this organism takes place only in response to the stimulus of light. Both in nature and in culture the mycelium of *O. flavida* is luminous. In a Porto Rican coffee plantation Prof. A. Müller could clearly discern the leaf spots due to the fungus at a distance of 2 to 3 ft. at night.

A description is given of the gemmifers, similar to the foregoing, produced by *Sclerotium coffeicola*, the causal organism of a coffee disease in Dutch and British Guiana and Trinidad [ibid., xi, pp. 26,

283]. These organs, consisting of a small, white, knob-shaped pedicel and a detachable, slender, white, acicular gemma, 1·5 to 4 by 0·05 to 0·1 mm., are considered to be modified fruit bodies (possibly of a *Typhula*), with functions similar to those of the analogous structures in *O. flavida*. The mycelium of *S. coffeicola* is furnished with clamp-connexions, indicating that this fungus also belongs to the Basidiomycetes.

GRATIA (A.) & MANIL (P.). **Différenciation sérologique des virus X et Y de la Pomme de terre chez les plantes infectées ou porteuses de ces virus.** [The serological differentiation of the X and Y potato viruses among plants infected by these viruses or carriers of them.] —*Comptes rendus Soc. de Biol.*, cxvii, 31, pp. 490–492, 1934.

Continuing the serological researches on plant viruses initiated by the first-named writer [*R.A.M.*, xiii, p. 542], the authors prepared sera from the juice of the following potato plants supplied by Quanjer from Holland: (1) normal President, (2) and (3) the same infected by the X and Y viruses, respectively, and (4) Duke of York bearing the X virus in a latent condition with no external symptoms. To these were added a fifth serum prepared from the Wilkopolenka de Poniak variety found at Gembloux (Belgium) with pronounced symptoms of the Y virus, and four sera obtained previously from ordinary mosaic potato plants in Belgium (probably the X virus).

Tested on juices prepared from healthy tobacco and potato, and also from the various mosaic-diseased plants, the anti-X sera produced extensive flocculation of all X-infected tobacco and potato plant juices containing the virus either in an active or latent form. On the other hand, they are without effect on the juices of healthy or Y-infected plants as well as on those attacked by tobacco or beetroot mosaic. K. Smith's X virus is thus a serologically distinct entity. The anti-X sera further produce flocculation in tobacco juice from plants inoculated with *Hyoscyamus* mosaic [ibid., xiv, p. 51] and also in that from potato tubers actively or latently infected by X mosaic. The latter observation is considered to be of practical importance as a means of eliminating diseased material in the work of seed selection. The infective principle appears to be much more plentiful in the outer layer of the tuber than in the central pulp, judging by the relative facility of flocculation.

The anti-Y sera are inactive not only on the juices of X-infected plants but also on those containing the Y virus. The negative results may be due either to the absence of antigenic properties in the Y virus; to its extreme frailty as compared with the high degree of resistance to adverse environmental conditions shown by X; or to its actual paucity compared with X. Possibly the delicacy of the Y virus may also necessitate special experimental conditions on which further researches are to be conducted.

GRATIA (A.) & MANIL (P.). **Les complexes de virus des plantes et la méthode sérologique.** [The complexes of plant viruses and the serological method.]—*Comptes rendus Soc. de Biol.*, cxvii, 31, pp. 493–494, 1934.

Previous studies by the first-named writer suggested a close analogy

between the mechanism of the virus diseases of plants and the bacteriophage phenomenon [*R.A.M.*, xiii, p. 276], and this line of research was followed up by an attempt to unite certain virus complexes in such a way that each of the components would attack a different tissue system, just as certain bacteriophages can be separated into varieties each attacking a single strain of the *Bacillus* tested. It has been experimentally shown that the X virus of potatoes induces lesions of the inner phloem and adjacent tissues, while the Y virus causes disintegration of the collenchyma (Quanjer's 'top necrosis' or 'acronecrosis' and 'acropetal necrosis', respectively) [ibid., x, p. 746; xi, p. 741; xiii, p. 798]. The complex of these two viruses produces a much more severe mosaic known as 'crinkle' [ibid., x, p. 615; xi, p. 738]. The synergism of the X and Y viruses is particularly evident in tobacco plants, which are totally destroyed with great rapidity by the complex, whereas each component singly causes only partial necrosis. Similarly, Murphy's moderately virulent A virus [ibid., xiii, p. 258] produces only mild mosaic symptoms in normal potato varieties, such as Irish Chieftain, President, and Arran Victory, whereas in masked carriers of the X virus, e.g. Up-to-Date, it causes a very severe and often fatal disorder, probably resulting from synergism between the new and the latent virus. These facts entirely corroborate the conclusions drawn from previous studies, which indicate that the latent virus is not to be regarded as a normal physiological constituent of the carrier plant, but as an alien element or antigen of a pathological character tolerated by the host in ordinary circumstances.

BIRKELAND (J. M.). **Photodynamic action of methylene blue on plant viruses.**—*Science*, N.S., lxxx, 2077, pp. 357–358, 1934.

Following the technique used by Perdrau and Todd (*Proc. Roy. Soc.*, B, cxii, p. 277, [1933]) in their study of the photodynamic action of methylene blue on nine animal viruses and several strains of bacteriophage, the writer investigated this factor in relation to Wingard's ring spot, streak (single virus streak) of tomato, and tobacco viruses 1 and 6 (Johnson), the last-named also known as the aucuba mosaic virus [*R.A.M.*, xiv, p. 127]. Ten c.c. of the virus-dye mixtures at P_H 5·8 to 6·0 were exposed in Petri dishes to a 500-watt lamp at a distance of 26 in. At various intervals 0·10 c.c. of the mixture was removed and used for the inoculation of test plants.

Judging by the results of infectivity tests on tobacco and cucumber, the ring spot virus was completely inactivated by two minutes' exposure. After 20 minutes the virulence of the streak virus was slightly reduced, but no diminution in the strength of tobacco viruses 1 and 6 was effected by one hour's exposure. Thionine, potassium indigo-disulphonate, and phenol-indo-phenol at hydrogen-ion concentrations of P_H 3·0, 7·0, and 8·0 also failed to reduce the virulence of tobacco virus 6.

It would appear from these data that plant viruses are generally more resistant to the photodynamic action of dyes than are animal viruses or bacteriophage.

Hatch (A. B.). **A jet-black mycelium forming ectotrophic mycorrhizae.** —*Svensk Bot. Tidskr.*, xxviii, 3, pp. 369–383, 6 figs., 1934.

This is a fuller account of the jet-black, slow-growing mycelium, provisionally designated *Mycelium radicis nigrostrigosum*, isolated from a distinctive form of black mycorrhiza of *Pinus sylvestris* in a northern Swedish experimental forest. Pure culture syntheses showed that the mycelium under observation grows very slowly, remains jet-black even to the tips of the hyphae, and forms typical mycorrhiza with *P. strobus* and *P. resinosa* [*R.A.M.*, xii, p. 386, 778].

Externally the mycorrhiza are characterized by a profusion of coarse, lustrous, jet-black hyphae, arranged in palisade-like groups, radiating from the pseudoparenchymatous mantle and distinguishable, under a low-power microscope, from those of the *M. r. atrovirens* type with which they were formerly confused. The individual hyphae of the mantle of *M. r. nigrostrigosum* on *P. strobus* measured 4 to 15 μ in width and the mantle itself was 30 to 60 μ in thickness. Hyaline intercellular hyphae, 4 to 5 μ broad, extend to the endodermis and form a network. The new mycelium has been found forming mycorrhiza on a large number of trees (besides pine) and shrubs, including *Picea*, *Abies*, *Pseudotsuga*, and *Tsuga* spp., larch, oak, beech, birch, *Carya* sp., and *Corylus rostrata*. It is widely distributed in Sweden and the United States and appears to be also found in Japan, being generally most abundant in relatively poor soils, and is considered to be undoubtedly responsible for the formation of the dark mycorrhiza previously attributed to *Rhizoctonia sylvestris* Melin.

Hatch (A. B.). **A culture chamber for the study of mycorrhizae.**—*Journ. Arnold Arboretum,* xv, 4, pp. 358–365, 1 pl., 1 fig., 1 diag., 1934.

The writer describes in detail and figures a chamber specially constructed for the purpose of establishing and maintaining pure cultures of mycorrhiza with a view to the investigation of the exact nature of mycotrophic relationships [*R.A.M.*, xiii, p. 458, and preceding abstract].

Weindling (R.). **Some factors influencing the character of interaction between Trichoderma and other soil fungi.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1140–1141, 1934.

Various internal and external factors have been found to affect the character of the interaction on nutrient media between *Trichoderma* and other soil fungi [*R.A.M.*, xiv, p. 53], the parasitic action of the former being suppressed under certain conditions of acidity, moisture, or temperature, and the colonies showing either mutual inhibition or compatibility. These phenomena can be connected with the properties of a lethal principle of *Trichoderma*. The action of *Trichoderma* is also modified by the host; in the case of *Pythium*, for instance, a lethal effect is readily obtained but is rarely accompanied by coiling round the hyphae.

WEINDLING (R.). **Various fungi recently found to be parasitic on Rhizoctonia solani.**—Abs. in *Phytopath.*, xxiv, 10, p. 1141, 1934.

Under experimental conditions the following fungi attacked *Rhizoctonia* [*Corticium*] *solani* in culture in a manner similar to that of *Trichoderma* [see preceding abstract], their virulence decreasing in the order given: *Acrostalagmus* spp., *Aspergillus niger*, *Penicillium* spp., *Fusarium lateritium* [*R.A.M.*, xiii, p. 108], *Botrytis cinerea*, and *Verticillium* spp.

WEINDLING (R.) & FAWCETT (H. S.). **Experiments in biological control of Rhizoctonia damping off.**—Abs. in *Phytopath.*, xxiv, 10, p. 1142, 1934.

Experiments in the protection of citrus seedlings from damping-off by *Rhizoctonia* [*Corticium*] *solani* in sterilized soils [in California] by inoculating the latter with *Trichoderma* [see preceding abstracts] were more successful at acid than at neutral reactions. The treatment was extended to non-sterilized soils with encouraging results. Since the growth of *C. solani* declines at very acid reactions its control through soil acidification is suggested to be primarily due to the increased antagonistic activities of other soil organisms, such as *Trichoderma*.

CARBONE (D.). **Sur la nature de la 'barrière' dans le Haricot vacciné et infecté de 'toile'. (Communication préliminaire.)** [On the nature of the 'barrier' in vaccinated Bean infected with 'toile'. (Preliminary communication.)]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 9, pp. 301–303, 1934.

When sections of an unvaccinated bean [*Phaseolus vulgaris*] plant inoculated with 'toile' disease [*Botrytis cinerea*: *R.A.M.*, xiii, p. 795] were stained with Ruzicka's liquid (which stains dead cells blue and living red) the mass of necrosed cells appeared as a bluish-black clump bounded by a layer of polygonal-celled wound tissue in which all the cells were coloured red (showing that they were still living when sectioned), except for a blue-black border along the innermost ones. The chloroplasts were everywhere small and few; in the blue cells they were often absent, and when present were stained blue.

In the pith of the plant vaccinated prior to inoculation only the cells in the middle of the diseased area were entirely bluish-black; around these were blue cells with blue precipitates and red ones with blue precipitates; around these again the cells were red. The chloroplasts, which were mostly of normal size, were abundantly present in cells either completely red or containing blue precipitates. Green plastids were noted in the blue cells. In another vaccinated plant which succumbed to inoculation the hyphae growing from the cells stained red failed to penetrate the layers farther out which had thickened blue walls and blue precipitates.

These observations show that the morphological transformation of the medullary cells from normal to the characteristic barrier formation began when they were still in full vital activity, typical dead cells appearing progressively later. They confirm the view that the immunity from toile disease conferred on beans by vaccination belongs to the

'hyperreactive hypersensibility' type which includes the examples of natural phyto-immunity studied by Dufrénoy and others [cf. ibid., xi, p. 391; xiii, p. 116].

Brown (W.). **Mechanism of disease resistance in plants.**—*Trans. Mycol. Soc.*, xix, 1, pp. 11–33, 1934.

In this presidential address to the British Mycological Society, delivered on 19th September, 1933, the author gives a brief, general survey of the data so far obtained in the studies of the highly complex problem of resistance in plants to parasitic diseases. He restricts himself chiefly to the physiological aspects of parasitism, which is considered solely from the chemical and physical points of view, and reviews the various theories which have been advanced to explain the penetration of the parasites into the host tissues. In his opinion, the mechanical factor in plant resistance may be discounted, at least in cases where enzymatic action exerted by the parasite is clearly marked. In considering the question of chemical resistance, he does not believe that the search for substances in the hosts, inhibiting the entry and development of the parasite, will lead to any general solution of selective parasitism; much more promising appears to be the theory which attempts to explain the problem by enzymatic activity of the parasites, and a brief outline is given of the progress made on these lines by himself and some other workers [cf. *R.A.M.*, xiii, p. 530].

Viennot-Bourgin (F.). **De l'influence des facteurs climatiques de 1933 et 1934 sur le développement de quelques parasites cryptogames.** [On the influence of the climatic factors of 1933 and 1934 on the development of some cryptogamic parasites.]—*Comptes rendus Acad. d'Agric. de France*, xx, 26, pp. 839–843, 1934.

In a recent article E. Foëx has stated that a high relative humidity (70 to 100) and a few days' rainfall promote the late infection of potato tubers by *Phytophthora infestans* without any external sign of disease on the foliage. This was exemplified in serious outbreaks on the Eerstelingen [Duke of York] variety in Pas-de-Calais (29th July, 1933) and at the Versailles Agricultural Research Institute during October [*R.A.M.*, xiii, p. 467]. In the same year slight attacks occurred at Grignon on the leaves of Abondance de Montvilliers, Duke of York, and Paulsen's Juli on 3rd July as a sequel to rains from 12th to 16th and 29th to 30th June. A fungicide was applied on the 5th and no further infection was observed, but on lifting and during storage a number of Bintje tubers showed typical late blight symptoms and developed the conidiophores and conidia of *P. infestans* in a moist chamber.

In 1934 the summer drought was even more excessive than in the preceding year. At Grignon a virulent outbreak of late blight occurred during the first week of October, following rain and high temperature (round about 26° C.) from 29th September to 4th October, on the foliar tufts at the tips of the haulms in certain varieties which had previously (mid-September) presented a positively scorched appearance. The extensive lesions bore profuse conidial fructifications. On lifting, some tubers were more or less severely rotted and after a week's storage

the K. of K. and Preussen varieties were heavily infected. It is apparent from these data that, under exceptional climatic conditions and even in the absence of Van Everdingen's requirements for a late blight epidemic [ibid., v, p. 628], serious attack may take place at an advanced stage of vegetation, when the infection tends to become rapidly localized in the ripening tubers.

Perithecia of *Microsphaera quercina* were abundant on oak (*Quercus sessiliflora*) shoots [ibid., xiii, p. 810] on the dry, calcareous slopes of the Grignon estate in October, 1934.

HARTISCH (J.). **Stoffwechselphysiologische Untersuchungen über die Blattrollkrankheit der Kartoffelpflanze.** [Metabolic and physiological investigations on Potato leaf roll.]—*Planta*, xxii, 5, pp. 692–719, 6 graphs, 1934.

Following a brief survey of previous work on the metabolic changes in potatoes affected with leaf roll [*R.A.M.*, xii, p. 48; xiii, p. 533], the writer gives a comprehensive, tabulated account of the results of his investigations of this problem at Leipzig University.

By means of iodine staining appreciable qualitative differences were detected between diseased and healthy material in the dextrin production accompanying starch hydrolysis, while quantitative methods specially devised for the separation of the dextrins from other carbohydrates in the expressed sap also showed that dextrin formation is greater in diseased than in healthy leaves and tubers. All the data relating to extra dextrin production in diseased potatoes pointed to an enhanced activity of the dextrinogen-amylases, the optimum reaction for which was P_H 3·5 to 4·5 as compared with 6·5 to 7·0 in healthy plants. The increased activity of the dextrinogen-amylases in affected plants would appear to bear some etiological relation to leaf roll.

A preliminary study of the effects of increased dextrin production on certain physiological processes, such as assimilation and respiration, has yielded promising results.

JONES (L. K.). **The rate of spread of the veinbanding virus on Potatoes.**—Abs. in *Phytopath.*, xxiv, 10, p. 1144, 1934.

In the summer of 1933 plantings of from 2 to 13 hills each of 31 virus-free seedling strains and ¼ acre of virus-free Early Rose potatoes were made near Pullman, Washington, at least ¼ mile from soil that had ever borne potatoes. The new plantings were surrounded by barley and lucerne fields. During the growing season natural infection by the veinbanding virus [*R.A.M.*, xiii, p. 533] was observed on the potato plants as follows: 13 seedling strains, 100 per cent.; 6 seedling strains, over 50 per cent.; Early Rose, 59 per cent.; 5 seedling strains, 10 to 50 per cent.; 7 seedling strains, nil.

KOCH (K.). **Aphid transmission of Potato yellow dwarf.**—*Phytopath.*, xxiv, 10, pp. 1126–1127, 1934.

The results of experiments under controlled greenhouse conditions in Wisconsin indicated that the peach aphid (*Myzus persicae*) may be largely responsible for the transmission of yellow dwarf of potatoes [*R.A.M.*, xiii, p. 721] in the field, an average of 60·5 per cent. infection

having been secured on Rural New Yorker, Irish Cobbler, and Bliss Triumph plants to which *M. persicae* was transferred from diseased Irish Cobblers. So far the outcome of similar tests with *Macrosiphum solanifolii* [*M. gei*] and *Thrips tabaci* has been mainly negative.

VINCENT (C. L.) & PAWSON (W. W.). **Factors affecting Potato seed piece decay.**—*Proc. Amer. Soc. Hort. Sci. 1933*, xxx, pp. 491–495, 1934.

Field and greenhouse tests carried out in Washington State showed that when potato seed pieces were sown in soil kept at 70° F. or over a relatively large amount of decay occurred. The decay of sets from sprouted tubers planted in soil at 70° or over was minimized by previously suberizing the cut surface in humid air. The storage of cut seed potatoes in a thin layer openly exposed to dry air (30 to 40 per cent. relative humidity) reduced germination, especially when the seed was planted in soil the temperature of which was over 70°. When the soil was kept 'soggy wet' for a long period much seed-piece decay occurred, indicating that poor stands resulting from early spring planting may be due partly to wet soil from which the air is excluded. Drying agents, such as lime, sulphur, and gypsum, were detrimental to cut seed when the potatoes were planted after the soil temperature had reached 70° or more, sulphur being particularly injurious.

SCOTT (C. E.) & THOMAS (H. EARL). **Downy mildew of the Hop in California.**—Abs. in *Phytopath.*, xxiv, 10, p. 1146, 1934.

The apparent incubation time for the leaf spots produced by *Pseudoperonospora humuli* on hops in California [*R.A.M.*, xiii, p. 802] in infections in late May and June, 1934, was 7 to 9 days, while for spike production it was 9 to 11 days. The infection periods were marked by rains preceded and followed by comparatively dry weather.

MCRAE (W.) & SUBRAMANIAM (L. S.). **Effect of mosaic on the tonnage and the juice of Sugar-Cane in Pusa, part IV.**—*Indian Journ. Agric. Sci.*, iv, 5, pp. 787–796, 1934.

In further investigations on the injury caused by sugar-cane mosaic in North Bihar, India [*R.A.M.*, xiii, p. 268], 36 plots of healthy and diseased Co. 213 cane were laid down alternately. A very small amount of infection spread to the mosaic-free plots, one clump becoming affected in each of seven plots. A count of the shoots after 11 weeks showed that germination was 4 per cent. less in the mosaic plots than it was in the healthy ones. This reduction of germination was confirmed by placing pieces of cane, each containing an eye, in moist sawdust in partial shade at temperatures ranging from 64° to 100° F.; of 500 eyes from healthy cane 437 germinated as against 419 for the mosaic cane, a difference of 3·6 per cent. When allowance was made for the loss in weight caused by insect attack, the mean weight of the stripped cane in the healthy and diseased plots was 46·12 and 40·62 maunds (1 maund = about 82 lb.), respectively, these figures representing a loss in weight due to mosaic alone of 11·9 per cent. The amount of juice extracted from the mosaic cane was 0·77 per cent. less than that

obtained from the healthy cane, though the quality, as measured by brix, glucose, sucrose, and purity remained unimpaired.

In the four successive seasons during which similar tests have been made the weight of the cane was less in the mosaic than in the healthy plots three times, the average difference being 8·2 per cent. per season; percentage juice to cane, brix, and glucose were each less twice, while glucose and purity were less once. The evidence so far obtained indicates that in Co. 213 mosaic probably reduces the weight of the cane, but there was no clear evidence that it affects the quality of the juice.

The figures given in the present paper refer to wholly mosaic-infected and mosaic-free canes, but locally, except in the experimental plots, no field of wholly infected Co. 213 cane exists, the average amount of infection in 1933 being only 0·58 per cent.; a 12 per cent. loss in weight of stripped cane in a wholly infected field is equivalent to a loss of only 0·07 per cent. on the ordinary crop [ibid., xiv, p. 80].

Lodder (Jacomina). **Die Hefesammlung des 'Centraalbureau voor Schimmelcultures': Beiträge zu einer Monographie der Hefearten. II. Teil. Die anaskosporogenen Hefen. Erste Hälfte.** [The yeast collection of the 'Centraalbureau voor Schimmelcultures': contributions to a monograph of the yeast species. Part II. The anascosporogenous yeasts. First half.]—*Thesis, Univ. of Utrecht,* 256 pp., 1 pl., 114 figs., Amsterdam, N. V. Noord-Hollandsche Uitgevers-maatschappij, 1934.

This comprehensive, fully documented study on the anascosporogenous yeasts deals only with a part of the extensive collection at the 'Centraalbureau voor Schimmelcultures', Baarn [cf. *R.A.M.*, x, p. 692] namely, the Rhodotorulaceae (comprising the species containing carotinoid pigments) [cf. ibid., v, p. 229] and one of the subfamilies of the Torulopsidaceae, i.e., the Torulopsoideae, the second subfamily, the Mycotoruloideae, being reserved for future treatment.

A critical review of the literature on the taxonomy of the anascosporogenous yeasts led to their division into three families, Rhodotorulaceae, Nectaromycetaceae, and Torulopsidaceae and the adoption of Ciferri's and Redaelli's system of classification of the Torulopsidaceae as amended by Langeron and Talice [ibid., xi, p. 476]. The author, however, reserves judgement as to the retention of the conidium-forming Nectaromycetaceae, though provisionally keeping it in this group. Since *Sporobolomyces* has been referred by Buller to the Basidiomycetes [ibid., xii, p. 777], only the doubtful genus *Nectaromyces* would remain. In the course of the investigations the need for keeping the carotin-containing forms in a separate family (the above-mentioned Rhodotorulaceae with the single genus *Rhodotorula* Harrison) became obvious, and 37 of the 160 anascosporogenous strains examined were accordingly placed in this family, representing 13 species and 10 varieties of *Rhodotorula*. The remaining 125 strains fell in the family Torulopsidaceae, having no conidia and no carotin. Of these 37 were found to form a pseudomycelium and sporiferous apparatus and were referred to the Mycotoruloideae while the other 86 belong to the Torulopsoideae, having no, or at most a primitive, pseudomycelium without any sporiferous apparatus. The Torulopsoideae comprise the

following genera: *Torulopsis* Berlese, *Pityrosporum* Sabouraud, *Mycoderma* Persoon emend. Leberle, *Kloeckera* Janke [ibid., xiii, p. 370], *Asporomyces* Chaborski, *Trigonopsis* Schachner, and *Schizoblastosporion* Ciferri. No justification can be found for the retention of *Eutorulopsis*, *Schizotorulopsis*, and *Microblastosporon*.

Torulopsis is sub-divided into two groups, each containing eleven species and one variety, (a) comprising the species capable of fermentation and (b) those devoid of this property. The three species of *Pityrosporum* [ibid., x, p. 311; xi, p. 642] (*P. malassezi*, *P. pachydermatis*, and *P. rhinoserosum*) are reduced to two, the last-named having been found identical with the second. Six species of *Mycoderma* are recognized and ten of *Kloeckera* (with one variety), while the genera *Asporomyces*, *Trigonopsis*, and *Schizoblastosporion* are each represented by only one species—*A. asporus*, *T. variabilis*, and *S. starkeyi-henricii*. Each of the genera under discussion is furnished with a key for the determination of the species comprised therein, and in conclusion a key is also given for the recognition of the seven genera constituting the subfamily Torulopsoideae.

WILSON (M.). **The distribution of the Uredineae in Scotland.**—*Trans. Bot. Soc. Edinburgh*, xxxi, 3, pp. 345–449, 1934.

A fully annotated list is given of 240 species of rusts occurring in Scotland, some 30 of which have not been recorded from England. Detailed descriptions are provided of the species not included in Grove's 'British Rust Fungi' (1913).

LOWE (J. L.). **The Polyporaceae of New York State (pileate species).**—*Bull. New York State Coll. of Forestry Techn. Publ.* 41, 142 pp., 2 pl., 1934.

An extensively annotated list, supplemented by a glossary, bibliography, index of genera and species, and synoptical key of the generic and specific arrangement, is given of 146 pileate Polyporaceae known to occur in New York State.

BOSE (S. R.). **Polyporaceae of Bengal Part X.**—Reprinted from *Journ. Dept. Sci.*, xi, 19 pp., 5 pl., 1934.

An annotated list, supplemented by a bibliography of 33 titles, is given of 15 Polyporaceae found in Bengal, including *Fomes pinicola* [*R.A.M.*, xiii, p. 604] on dead *Tsuga brunoniana* at Darjeeling (previously detected in Assam on *Pinus khasya* and in Burmese pine forests); *F. albomarginatus* on bark of living *Shorea robusta* at Jalpaiguri, and *F. conchatus* [ibid., v, p. 265] growing on a mango tree trunk in the Calcutta district (also in Bombay).

GROVE (W. B.). **Mycological notes. VII.**—*Journ. of Botany*, lxxii, 862, pp. 265–271, 1 fig., 1934.

These notes include a description of *Septoria gladioli* [*R.A.M.*, xiv, p. 12] on *Gladiolus* leaves from Cyprus, a study of which has persuaded the writer that the two pycnidial forms comprised in the material, characterized by (1) *Ascochyta*-like, linear-fusoid, uni- (possibly sometimes bi-) septate spores, 24 to 30 by 3·5 to 4 μ, and (2) typical

Septoria-like, elongated, curvilinear, non-septate spores, 40 to 60 by 2 to 3·5 μ, are stages in the one fungus, other cases of *Septoria* and *Stagonospora* passing through an *Ascochyta* stage being cited.

In a discussion of the genus *Fusidomus*, the author calls attention to the pycnidial stages of *Gibberella*, in one of which, *Stagonostroma* Died., hyaline, fusoid, pluriseptate pycnospores resembling *Fusarium* conidia are borne in conceptacles arranged either singly on the host or in botryose aggregations on a stroma. According to von Höhnel (*Hedwigia*, lx, p. 157, 1919), two other pycnidial stages, *Cyanophomella* and *Cyanochyta*, belong to *Gibberella*.

MEHRLICH (F. P.). **Physiologic specialization in Phytophthora species.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1149–1150, 1934.

Of a number of species of *Phytophthora* from various sources inoculated into pineapple plants [(?) in Hawaii] with a view to determining the relationships between those responsible for heart rot and allied pathogens of other economic crops, virulent infection was caused by one culture of *P. cinnamomi* from cinnamon, one of the same species from pineapple in Australia, and seven from the same host in Hawaii; one each of *P. palmivora* (*P. meadii*) [*R.A.M.*, vii, p. 602; xiv, p. 123] from *Hevea* rubber and pineapple, one of the same fungus (cacao group) [ibid., viii, p. 526] from an unknown host; one each of *P. parasitica* (*P. melongenae*) [ibid., x, p. 755] from eggplant, *Antirrhinum*, and tomato, and two of the same organism from potato.

These data are considered to support the conclusions of Ashby, Tucker [loc. cit.], and Leonian [ibid., vi, p. 189] regarding the unsuitability of pathogenicity as a basis for specific separation in *Phytophthora*. The differentiation, for instance, of *P. cambivora* from *P. cinnamomi* on the grounds of varying susceptibility in potato tubers to their attack appears to be of questionable validity.

MEHRLICH (F. P.). **Medium for growth of Pythiaceous fungi.**—*Phytopath.*, xxiv, 10, pp. 1127–1128, 1934.

The following modified formula of the maltose malt medium used by Leonian for the culture of some Sphaeropsidales [*R.A.M.*, iii, p. 544] has given very good results during the last three years at the Pineapple Experiment Station, Honolulu, Hawaii, in the study of Sideris's species of *Phytophthora*, *Nematosporangium*, and *Pythium* [isolated mainly from pineapple: ibid., x, p. 740; xiv, p. 95]: 1 gm. potassium dihydrogen phosphate, 0·5 gm. magnesium sulphate, 1 gm. bactopeptone (Difco standardized), 5 gm. Difco extract of malt, desiccated powder, 15 gm. dextrose, and 1 l. water, autoclaved at 15 lb. for 30 minutes.

MEHRLICH (F. P.). **Nonsterile soil leachate stimulating to zoosporangia production by Phytophthora sp.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1139–1140, 1934.

By growing *Phytophthora cinnamomi* or *P. parasitica* [*R.A.M.*, xii, p. 303] in a maltose-malt extract broth, followed by rinsing in sterile distilled water and incubation in a non-sterile percolate of field soil, zoosporangia were found to be more consistently and abundantly produced than by other published methods. The zoosporangia of *P. cinna-*

momi formed under these conditions are papillate in contrast to the blunt, non-papillate organs described by other workers.

BARRETT (J. T.). **A Chytridiaceous parasite of Phytophthora.**—Abs. in *Phytopath.*, xxiv, 10, p. 1138, 1934.

A species of *Pleolpidium* was detected in a *Phytophthora* isolated from greenhouse soil [in California] occupied by snapdragon [*Antirrhinum majus*] plants affected by crown rot due to *P. cactorum* [*R.A.M.*, xiii, p. 581]. The parasite infects both the hyphae and sporangia of the *Phytophthora*, causing swellings in the former but no obvious change in the latter until the swarm spore stage is reached. Inoculation tests gave positive results.

NAGEL (C. M.). **Conidial production in species of Cercospora in pure culture.**—*Phytopath.*, xxiv, 10, pp. 1101–1110, 1 fig., 1934.

Studies were made at the Iowa Agricultural Experiment Station of potato-dextrose agar cultures of *Cercospora althaeina*, *C. avicularis*, *C. cruenta* from cowpea [*R.A.M.*, xii, p. 725; xiii, p. 11], *C. davisii* [*C. zebrina*] from *Melilotus alba* [ibid., xii, p. 269], *C. dubia* from *Chenopodium album*, *Cercospora muhlenbergiae*, *C. moricola* [ibid., xi, p. 475], *C. mirabilis*, *C. medicaginis* [*C. zebrina*], *C. physalidis* from *Physalis* sp., and *C. setariae* from *Setaria glauca*, and of *C. beticola* [ibid., xi, pp. 277, 498] on sugar beet leaf agar. Transfers from sporulating cultures yielded spores in profusion, whereas those from mycelium produced largely sterile hyphae. With the adoption of definite transfer intervals ranging from four to six days, conidia-producing cultures were maintained for periods varying from five weeks to three months.

HANSEN (H. N.) & SMITH (R. E.). **Interspecific anastomosis and the origin of new types in imperfect fungi.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1144–1145, 1934.

Anastomosis was observed to take place between *Botrytis allii* [*R.A.M.*, xiv, p. 49] and *B. ricini* grown together in culture. Of 20 monospore isolations from such an anastomosing mixed culture, 6 were identical with one parent, 9 resembled the other, and 5 were markedly different from either. Repeated isolations from the aberrant cultures led to the segregation of three types for which new varietal or even specific rank appeared to be warranted. These types have remained constant through three series of monospore cultures. It is suggested that aberrant forms from combined, interspecific cultures of imperfect fungi may arise from genotypic changes induced by the presence of specifically different nuclei in the same cell introduced by anastomosis.

CURZI (M.). **Complexité spécifique de la 'Dematophora glomerata' Viala.** [The specific complexity of *Dematophora glomerata* Viala.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 9, pp. 321–325, 1934.

In this paper the author adduces reasons in support of his view, based partly on the relationship he established between the genera *Scopulariopsis*, *Stysanus*, and *Microascus* [*R.A.M.*, xi, p. 6], that the

mycelial, pycnidial, sclerotial, and stilbaceous forms assigned by Viala to *Dematophora glomerata* belong to three distinct species of fungi. No evidence has been brought forward to confirm the opinion expressed by Viala in 1891 that '*D. glomerata*' causes serious and widespread damage to vines; for three years the author examined all types of vine foot rot from various parts of Italy, but only material from one vineyard on light soil near Rome gave rise to all four forms in culture. In this case the pycnidia were ostiolate, hairy, and lined with very short sporophores containing ovoid, hyaline spores, 2·75 to 3·25 by 1·5 to 2 μ. The pycnidial form resembles a *Lasiophoma*, but by reason of the ostiole (which Viala overlooked) is allied to *Chaetasbolisia erysiphoides* (Griff. et Maubl.) Speg. which has, however, silky pycnidia and occurs on holm oak [*Quercus ilex*]. The author names the pycnidial form [but without a diagnosis] *Vialaella glomerata* n. gen., n.sp. (= *Dematophora glomerata* p.p.). The sclerotial form is an immature *Microascus*, and the conidial form belongs to a strain of *Stysanus stemonites* [ibid., xi, p. 612], from which in culture it has no essential difference, though in nature it appears to be smaller.

SMITH (C. O.). **Inoculations showing the wide host range of Botryosphaeria ribis.**—*Journ. Agric. Res.*, xlix, 5 pp. 467–476, 3 pl., 1934.

After a brief reference to the history of *Botryosphaeria ribis* and to previous studies of its host range [*R.A.M.*, xii, p. 633; xiii, p. 249], the author gives a tabulated account of his pathogenicity tests of conidial (*Dothiorella*) strains of *B. ribis chromogena* isolated from walnut (*Juglans regia*), avocado (*Persea americana*) [*P. gratissima*], lemon (*Citrus limonia*), and *Cocos plumosa*, on over fifty species of plants distributed among thirty-nine genera and twenty families. The results indicated that these strains are identical and that under the conditions of the experiments, the mycelium was able to invade the bark and woody tissues of a number of species of economic importance, suggesting that at least some of the many allied species of *Botryosphaeria* and *Dothiorella* which have been previously described chiefly on the ground of their host relationships should be regarded as identical.

While, in almost all the inoculations, healthy host tissue was invaded, certain of the species of host plants were apparently more resistant to infection than others, and it is believed that under natural conditions such hosts are rarely, if ever, infected, because of insufficiency of inoculum to break down their initial resistance.

BARRETT (J. T.). **Observations on the basidial stage of Sclerotium rolfsii.** —Abs. in *Phytopath.*, xxiv, 10, pp. 1137–1138, 1934.

Two cultures of *Sclerotium rolfsii* originating in the United States have recently produced the perfect stage [*R.A.M.*, xiii, p. 273; xiv, p. 125], which has been compared with a culture of *Corticium rolfsii* (Sacc.) Curzi [ibid., xi, p. 748] and with a basidium-forming strain of *S. rolfsii* from New Zealand. The vegetative and sclerotial characters of the American cultures were compared with one of *C. centrifugum* (Sev.) Bres. from Italy. From these comparisons it appears probable that the two American cultures and the New Zealand strain should be referred to *C. rolfsii*.

BEALE (HELEN P.). **The serum reactions as an aid in the study of filterable viruses of plants.**—*Contrib. Boyce Thompson Inst.*, vi, 3, pp. 407–435, 1 graph, 1934.

After a brief review of the literature dealing with the serological study of viruses in plants [*R.A.M.*, xii, p. 398, and above, p. 185], the author gives full details of experiments, the results of which indicated that the precipitin reaction may be a useful qualitative test in the detection of masked virus carriers, in the identification of new hosts, and also in the classification of plant viruses. Extracts from *Solanum melongena*, *S. sisymbrifolium*, *Physalis peruviana*, *Capsicum minimum* and *C. frutescens* [*C. annuum*] affected with Johnson's tobacco mosaic virus No. 1, and of Turkish tobacco affected with aucuba mosaic and attenuated tobacco mosaic [ibid., xiv, p. 61], gave a positive precipitin reaction with antiserum to tobacco virus No. 1, while extracts from other Solanaceous plants affected with mosaic diseases other than the tobacco mosaic reacted negatively with the anti-serum. A detailed description is also given of a method devised for determining the antigenic content of saline extracts of tobacco virus No. 1 to which phenol has been added, and also of certain modifications to Holmes's local lesion method [cf. ibid., xii, p. 526] for the estimation of the active virus concentration in these extracts.

It was further shown that differences of the order of 50 per cent. in the concentration of virus in tobacco mosaic No. 1 extracts may be demonstrated by inoculation of no more than sixteen *Nicotiana glutinosa* plants, but by increasing the number of inoculated plants it ought to be possible to demonstrate differences as small as 25 per cent. A quantitative relation was found to exist between the antigenic content and the active virus concentration of the extracts used in the tests. So far no evidence has been obtained that the specific antigenic substance in tobacco mosaic No. 1 may not be the virus itself.

YOUDEN (W. J.) & BEALE (HELEN P.). **A statistical study of the local lesion method for estimating Tobacco mosaic virus.**—*Contrib. Boyce Thompson Inst.*, vi, 3, pp. 437–454, 2 graphs, 1934.

This is a detailed account of the modification made by the senior author in Holmes's local lesion method [see preceding abstract] for the estimation of the concentration of the tobacco mosaic virus. By submitting a large amount of experimental data to statistical reduction, employing the analysis of variance, he obtained an accurate estimation of the degree of variability in reaction of the different plants tested, and demonstrated the existence of a gradient of susceptibility between the leaves at the different positions on the plants. In illustrating this method by some concrete examples it is shown that by using it the experimental error of the lesion count obtained from a single inoculated leaf is reduced to approximately one-third of the error reported in the original description of the method, thus trebling the accuracy of the results obtained with a given number of test plants. A further improvement consists in an experimental arrangement permitting of comparing a number of virus preparations without unnecessary duplication of a reference standard; this is attained by so distributing the inoculations

with the different preparations tested that each appears equally often on every plant and at all leaf positions.

Holmes (F. O.). **Increases of Tobacco-mosaic virus in the absence of chlorophyll and light.**—*Phytopath.*, xxiv, 10, pp. 1125–1126, 1934.

The white, apparently chlorophyll-free areas of variegated *Capsicum frutescens* [*C. annuum*] leaves were found to respond to inoculation with the tobacco mosaic virus [see preceding abstracts] by the production of necrotic local lesions similar to those developing on normal green foliage [*R.A.M.*, xiv, p. 126], a fact suggesting that the multiplication of the virus is not dependent on the presence of chlorophyll. This conclusion is supported by the results of controlled experiments in which the undiluted juice of etiolated pieces of Green Mountain potato stems inoculated with the tobacco mosaic virus after cutting and then kept in total darkness was extracted periodically and used for inoculations on *Nicotiana glutinosa*. The average numbers of necrotic lesions from two tests 1, 2, 3, 5, 7, 10, 12, 14, and 16 days after inoculation of the cut pieces were 1, 1, 12, 58, 193, 503, 408, 437, and 641, respectively, a rate of increase in virus concentration comparable to that occurring in green potato stems and leaves inoculated with the tobacco mosaic virus under ordinary lighting conditions. In another similar test, the tobacco mosaic virus increased at a practically normal rate in chlorophyll-containing tomato plants from which light was excluded. Photosynthesis, therefore, is apparently not essential to the multiplication of this virus [cf. ibid., xiv, p. 127].

Uppal (B. N.). **The movement of Tobacco mosaic virus in leaves of Nicotiana sylvestris.**—*Indian Journ. Agric. Sci.*, iv, 5, pp. 865–873, 2 pl., 1934.

Experimental evidence was obtained by the author, working at Princeton, N.J., that when well-developed leaves of *Nicotiana sylvestris* plants were inoculated with the virus of ordinary tobacco mosaic [see preceding abstracts] it passed from the upper to the lower epidermal cells in sufficient concentration to serve as a source of infection to healthy bean leaves inoculated with the juice 36 to 40 hours later, and continued to increase in concentration, as determined by the number of lesions it produced, for some time. It travelled from the epidermis to the mesophyll below in about 4 hours. If the average thickness of an inoculated leaf of *N. sylvestris* is taken as 275 μ, the rate of spread of the virus in the leaf tissue under the experimental conditions was roughly 7 to 8 μ per hour, independently of the movements of water and food in the leaf.

Uppal (B. N.). **The effect of dilution on the thermal death rate of Tobacco-mosaic virus.**—*Indian Journ. Agric. Sci.*, iv, 5, pp. 874–879, 1934.

When the effect of dilution on the thermal death-rate of the ordinary tobacco mosaic virus [see preceding abstracts] was determined by the local lesion method on *Nicotiana glutinosa* and a hybrid between it and *N. tabacum*, the virus was inactivated in 10 minutes at temperatures between 86° and 87°, 82° and 84°, and 77° and 78° C. at dilutions of

1 in 10, 1 in 100, and 1 in 1,000, respectively. The thermal death point was close to 70° at a dilution of 1 in 10,000.

STANLEY (W. M.). **The action of high frequency sound waves on Tobacco mosaic virus.**—*Science*, N.S., lxxx, 2076, pp. 339–340, 1934.

Following up Takahashi's and Christensen's experiments [*R.A.M.*, xiii, p. 658], the writer subjected samples of tobacco mosaic virus to supersonic radiation by a 500-watt apparatus similar to that described by E. N. Harvey (*Biol. Bull.*, lix, p. 306, 1930) at about half intensity for nine 10-minute periods interrupted by 5-minute intervals for cooling. As shown by the first-mentioned workers, the virus prepared by their method (which left over 99 per cent. of extraneous matter), as well as a purified virus diluted with nine parts of untreated healthy juice, was almost completely inactivated at atmospheric pressure by high frequency sound waves. If infectious juice is sealed under a high vacuum to prevent cavitation (expulsion of dissolved gas) there is little indication (judging by the number of lesions produced on *Nicotiana glutinosa* and *Phaseolus vulgaris*) of inactivation by these waves. Purified virus when exposed to high frequency sound radiation at atmospheric pressure gives about 60 per cent. as many lesions as the untreated control, while practically no inactivation follows the irradiation of purified virus under a high vacuum.

It would appear from these results that virus inactivation by supersonic radiation is associated with cavitation of dissolved gas and with the presence of extraneous matter in untreated juice, since high frequency sound waves of great intensity have practically no effect on purified virus under a high vacuum.

STANLEY (W. M.). **Chemical studies on the virus of Tobacco mosaic. I. Some effects of trypsin.**—*Phytopath.*, xxiv, 10, pp. 1055–1085, 1 fig., 2 graphs, 1934.

A comprehensive, fully tabulated account is given of the writer's studies on some effects of trypsin on the virus of tobacco mosaic [see preceding abstracts], the tests being carried out by determining the number of local lesions produced by the treated and control viruses on *Nicotiana glutinosa* and *Phaseolus vulgaris*. Evidence is adduced that the decrease in infectivity of the virus following the addition of trypsin (0·1 mg. trypsin nitrogen per c.c. in a 0·01 N hydrochloric acid solution) was not due to the proteolytic activity of this substance but rather to its capacity for inducing in the plants an increased resistance to the disease. The decrease in infectivity after treating with trypsin was further demonstrated on a number of other plants [a list of which is given] and was also found to hold good for several other viruses.

DUFRÉNOY (J.). **Un virus des Renonculacées transmissible au Nicotiana tabacum.** [A virus of the Ranunculaceae transmissible to *Nicotiana tabacum*.]—*Comptes rendus Soc. de Biol.*, cxvii, 30, pp. 346–348, 1 fig., 1934.

Tobacco leaves inoculated with the juice of peonies showing concentric, annular, chlorotic lesions near Bordeaux and Brive developed the typical symptoms of streak caused by the complex 'potato virus X plus

tobacco virus' [*R.A.M.*, xii, p. 333; xiii, pp. 463, 533, and above, p. 186]. Foliage inoculated with juice extracted from the green tissues of the affected peony leaves taken from the neighbourhood of the chlorotic lesions showed neither local reactions nor retardation of growth. *Petunia* plants inoculated with juice from the chlorotic areas on peony leaves contracted mosaic and their development was delayed.

HOPKINS (J. C. F.). **Mycological notes. Seasonal notes on Tobacco diseases. 7. Spraying in seed-beds and lands.**—*Rhodesia Agric. Journ.*, xxxi, 10, pp. 727–734, 1934.

In an experiment carried out in Rhodesia, tobacco plants grown under conditions favourable to the development of frog eye [*Cercospora nicotianae*: *R.A.M.*, xiii, p. 277] were sprayed at approximately weekly intervals from the time when the leaves were the size of a shilling until transplanting (five applications being made) with 'capex' and 'lunevale' dry Bordeaux, and bouisol [ibid., xiii, pp. 174, 745].

The Bordeaux mixture prepared from dry Bordeaux (of which 8 lb. in 50 galls. and 90 galls. water, respectively, for capex and lunevale gives a strength of 4–4–50) killed off many very small seedlings at the first application and slightly scorched the largest leaves, but the burns did not adversely affect growth or develop into serious lesions.

After the fourth application no disease could be detected in the sprayed beds, whereas the control bed was riddled with frog eye. Two days later the plants were inoculated by means of an atomizer with a mixed suspension of the bacteria of angular leaf spot [*Bacterium angulatum*: ibid., xiii, pp. 14, 274] and wildfire [*Bact. tabacum*: ibid., xiii, p. 132], the treated beds being again sprayed three days afterwards, i.e., a week before transplanting. No angular leaf spot or wildfire subsequently appeared in the plots set out with the sprayed plants, though present on those from the control beds. Bouisol, which does not appear to have been used before on tobacco, gave satisfactory results [cf. ibid., xiv, p. 84].

The paper terminates with notes on the type of equipment recommended, the preparation of home-made Bordeaux mixture, and field spraying.

Control of blue mould of Tobacco.—*Fruit World of Australia*, xxxv, 10, p. 585, 1934.

In 1934, practically the whole tobacco crop in New South Wales was destroyed by blue mould [*Peronospora tabacina*: *R.A.M.*, xiii, p. 332]. A proclamation has since been issued requiring every owner and occupier of land on which tobacco is growing on 31st May in any year to uproot and burn every tobacco plant not later than 30th June following. Experimental evidence is stated to have shown that the destruction of volunteer plants and remains from the previous crop considerably assists control.

SHERBAKOFF (C. D.). **Tobacco wilt caused by Verticillium albo-atrum.**—*Plant Disease Reporter*, xviii, 12, p. 153, 1934. [Mimeographed.]

Verticillium albo-atrum was isolated in September, 1934, from the fibro-vascular tissues of one wilted leaf on an otherwise healthy Burley

tobacco plant, this being apparently the first authenticated record of the fungus on this host [*R.A.M.*, x, p. 757].

GARDNER (M. W.) & WHIPPLE (O. C.). **Spotted wilt of Tomatoes and its transmission by thrips.**—Abs. in *Phytopath.*, xxiv, 10, p. 1136, 1934.

In the cooler coastal regions [of California] tomato spotted wilt is prevalent among nasturtiums [*Tropaeolum majus*] and has also been detected on aster [*Callistephus chinensis*], cineraria, *Datura*, petunia, dahlia, calceolaria, calla [*Zantedeschia aethiopica*], pepper [*Capsicum annuum*], and eggplant [see above, p. 129]. The virus is transmissible by rubbing to a large number of hosts [which are listed] including lupins, broad bean [*Vicia faba*], lettuce, and nettles. Thrips have transmitted infection to several of these hosts. Under warm conditions the earlier necrotic symptoms are succeeded by stunting, mottling, and leaf distortion, while in the cooler regions the necrosis may destroy the plants in the form of die-back or streak. Frequent fumigation and roguing gave commercial control in a greenhouse. Infected plant beds are an important source of field infection.

TAKAHASHI (W. N.) & RAWLINS (T. E.). **Application of stream double refraction in the identification of streak diseases of Tomato.**—*Phytopath.*, xxiv, 10, pp. 1111–1115, 1934.

The writers' experiments [the data resulting from which are fully tabulated] at the University of California showed that juice from streaked tomato plants infected with a combination of tobacco mosaic and potato latent viruses [*R.A.M.*, xiii, p. 797, and above, p. 199] exhibits a stream double refraction indistinguishable from that manifested by tomato plants infected by tobacco mosaic virus alone [ibid., xii, p. 525]. Juice from tomato plants infected with die-back streak reacts to stream double refraction in a manner indistinguishable from that of normal individuals. This technique, therefore, may be used to differentiate plants infected with combination streak from those suffering from die-back streak [see next abstract].

SHAPOVALOV (M.). **Some host responses in graft transmissions of dieback streak of Tomatoes.**—Abs. in *Phytopath.*, xxiv, 10, p. 1149, 1934.

Mechanical transmission of the die-back form of tomato streak [prevalent on the Pacific Coast: *R.A.M.*, xiii, p. 278] was obtained with tobacco and *Nicotiana glutinosa* in addition to tomato and *Datura stramonium*. Tobacco, *N. glutinosa*, and tomato inoculated by grafting contracted severe streak necrosis. Healthy *D. stramonium* grafted on any of these developed puckering and coarse mottling of the foliage without necrosis, and the plants thus affected, grafted on healthy tobacco, *N. glutinosa*, and tomato induced typical die-back streak. Healthy *N. glauca* grafted on streaked tomato, tobacco, and *N. glutinosa* occasionally showed a sparse necrotic spotting of the older leaves without other symptoms, and the tops of such *N. glauca* plants, grafted on healthy susceptible hosts, failed to transmit the disease.

Dufrénoy (J.) & Shapovalov (M.). **Cytological changes in the callus of the graft union in connexion with curly top in Tomatoes.**—*Phytopath.*, xxiv, 10, pp. 1116–1118, 2 figs., 1934.

The following were the principal changes observed in the callus tissues formed at the graft union between an apparently healthy and a curly top-infected tomato [*R.A.M.*, xi, p. 210; xiii, p. 278]: (1) death and gummy degeneration of many of the cells adjoining the contact surfaces of the two plants; (2) reversion to the meristematic condition of the underlying cells, and a bridging-over process by hyperplastic cells; and (3) a very abundant formation of calcium oxalate in some of the cells deeply situated in the callus.

Alexander (L. J.). **Leaf mold resistance in the Tomato.**—*Ohio Agric. Exper. Stat. Bull.* 539, 26 pp., 5 figs., 1934.

A fully tabulated account is given of the results so far obtained in experiments (still in progress) under controlled conditions at the Ohio Agricultural Experiment Station on the development of a new tomato variety resistant to leaf mould (*Cladosporium fulvum*) [*R.A.M.*, xiii, p. 685].

Five out of 180 varieties of the common tomato (*Lycopersicum esculentum*) were found to possess some degree of resistance to the disease, namely, Main Crop, Norduke, Satisfaction, Stirling Castle, and Up-to-Date, while resistance is characteristic of the so-called Red Currant tomato (*L. pimpinellifolium*), which L. H. Bailey states is a synonym of *Solanum racemigerum* [ibid., xii, p. 477]. The partial resistance of Stirling Castle and Satisfaction, the two best commercial varieties in this respect, was found to persist in some of the progeny of crosses between them and the susceptible but otherwise desirable Globe and Marhio, the character being apparently recessive in Stirling Castle and dominant in Satisfaction. However, following prolonged exposure to infection in commercial greenhouses, individual plants of both these semi-resistant varieties contracted leaf mould in a severe form, with the result that this particular line of investigation had to be discontinued.

Two off-type plants resistant to *C. fulvum* were detected among Globe crops in two commercial greenhouses. The F_1 progenies of both these plants segregated for resistance and morphological characters. After selfing the first plant (No. 50) for four generations, four of the F_4 progenies appeared to be homozygous for resistance. The F_1, F_2, and F_3 progenies of crosses between an F_1 seedling from plant 50 and Marhio and between the same seedling and Globe largely segregated for resistance. One selfed F_2 and a large number of selfed F_4 individuals were proved to be homozygous for resistance by the uniform resistance of all the selfs and back-crosses derived from them. The factor controlling resistance in these crosses has been shown to be dominant.

Hitherto no evidence is forthcoming of the existence of biologic strains of the pathogen which might complicate the work of breeding for the combination of resistance with desirable vegetative characteristics.

Anthracnose diseases of shade trees. Elm diseases. Leaf blotch of Horse Chestnut.—*New Jersey Agric. Exper. Stat. Circs.* 307, 308, 309, 6 pp., 1934.

Popular notes are given on the symptoms, mode of infection, and control in New Jersey of anthracnose of plane [*Gnomonia veneta*: *R.A.M.*, xii, p. 251], oak [*G. veneta*: ibid., vi, p. 215], maple [*Gloeosporium apocryptum*], and other shade trees; black spot [*Gnomonia ulmea*: ibid., xii, p. 251], *Cephalosporium* canker [ibid., xiii, p. 478], *Verticillium* wilt, and Dutch disease [*Ceratostomella ulmi*: see next abstract] of elms; and leaf blotch of horse chestnut [*Guignardia aesculi*: ibid., xii, p. 251].

Present status of the Dutch Elm disease.—*Plant Disease Reporter*, xviii, 13, p. 167, 1934. [Mimeographed.]

On 10th October, 1934, the total number of trees in the United States proved to have been affected by the Dutch elm disease, as determined by the growth of *Graphium* [*Ceratostomella*] *ulmi* in culture, was 7,432, of which 4,940 were situated in New Jersey [*R.A.M.*, xiv, p. 63], 2,420 in New York, 56 in Connecticut, 11 in Ohio, 4 in Indiana, and 1 in Maryland. In New York and Connecticut infected trees are being destroyed immediately upon detection, but in New Jersey the work of systematic eradication is hampered by lack of funds.

Pierce (A. S.). **Positive infection trials with Elm 'wilt' fungi.**—*Science*, N.S., lxxx, 2078, p. 385, 1934.

Positive results have been obtained in inoculation tests with three of the fungi isolated by H. A. Harris from wilted elms in Illinois, namely, *Coniothyrium* 'A' and 'B' and *Phoma* 'B' [*R.A.M.*, xii, p. 124].

Pycnidia of *C.* 'A' developed in the exposed xylem of the four three-year-old elm seedlings inoculated with this fungus and the inoculated lateral branch of one seedling showed a gradual but definite wilt, which killed the branch in about four months from inoculation. The causal organism was recovered from the diseased tissues down to 20 cm. below the point of inoculation. Similar results were obtained with *C.* 'B', which caused generalized infection on one of the two seedlings inoculated. The fungus was recovered from points up to 15 cm. above and 12 cm. below the site of inoculation.

Drops of a spore suspension of *P.* 'B', placed on living, detached elm leaves suspended in a Petri dish with the open end of the petiole immersed in water [cf. ibid., iv, p. 375], produced rapid infection, pycnidia being formed in the mesophyll within five days.

Esmarch (F.). **Blatt- und Fruchtkrankheiten der Walnuss.** [Leaf and fruit diseases of the Walnut.]—*Die Kranke Pflanze*, xi, 10, pp. 117–119, 1 col. pl., 1934.

In connexion with official propaganda for the extension of walnut cultivation in Germany, where not more than 15 per cent. (at the outside) of the national requirements are met by the present stand of 1,500,000 trees, popular notes are given on some of the diseases affecting the crop. These include the leaf and fruit spots due to *Gnomonia*

leptostyla [*R.A.M.*, xi, p. 79], *Ascochyta juglandis* [ibid., ix, p. 419], *Microstroma juglandis* [ibid., iii, p. 260; ix, p. 275], and *Gloeosporium epicarpii*, and bacterial blight (*Pseudomonas* [*Bacterium*] *juglandis*) [ibid., xiii, p. 551]. The last-named has already been reported from Holland, Switzerland, the United States, South Australia, and New Zealand, so that its introduction into Germany is presumably only a matter of time. According to Eriksson the Erhardt variety is resistant to bacterial blight.

MILLER (P. W.). **Observations on Filbert diseases in Washington and Oregon.**—*Plant Disease Reporter*, xviii, 12, pp. 155–156, 1934. [Mimeographed.]

Bacterial blight [*Bacterium juglandis*: see preceding abstract] was observed during the first week of September, 1934, in a number of Washington filbert [*Corylus avellana*] orchards [*R.A.M.*, xiii, p. 811], the Du Chilly variety being particularly severely attacked in Lewis County. In older (five to ten years) trees the upper buds and young twigs were killed, whereas in young ones the trunk tissues are commonly destroyed. The disease occurred principally on trees enfeebled by adverse environmental conditions. The Turkish filbert (*C. colurna*) was also found to be infected by bacterial blight, the organism being mostly confined to the current season's growth though a few small cankers were also found on one-year-old branches. *C. colurna*, in view of the resistance of its older growth to bacterial blight, gives some promise of utility as a root-stock for the susceptible Barcelona variety.

In Oregon the native wild hazel (*C. californica*) [*C. rostrata* Ait.] was found at the same time to be attacked on the under side of the leaves by mildew (*Phyllactinia corylea*) [ibid., xiii, p. 308], which was also detected on adjacent cultivated Brixnut filberts.

VENKATA RAO (M. G.) & IYENGAR (K. G.). **Studies in spike disease of Sandal. Methods of inoculation and variation of results under different methods.**—*Indian Forester*, lx, 10, pp. 689–701, 1934.

An account is given of the methods successfully used by the writers in the transmission of sandal spike disease [*R.A.M.*, xiii, p. 735] in Mysore. Twig grafting proved to be the most satisfactory, giving 100 per cent. successful transmission when union resulted, as against 63 per cent. from budding, 18 per cent. from patch bark grafts, and 17 per cent. from the insertion of a spiked leaf between the bark and wood. Infection only resulted when organic union was secured. The negative results obtained in a number of budding experiments even when union occurred cannot be attributed to inherent immunity on the part of the plants, to which spike can usually be communicated by reinoculation, but may be due either to the unequal distribution of the virus in different parts of an infected twig and its probable absence from some, or to individual variations in the minimum amount of virus required for successful transmission. Both for twig grafts and buds the average incubation period of the disease is three to four months, the highest incidence of infection being obtained from inoculations made in June and the lowest from those in October. Successful transmission of spike through the haustoria was effected in several cases of three- to five-year-

old plants that had attained a height of 5 to 8 ft., the failure of this mode of communication in younger saplings being ascribed to the incapacity of their haustoria to attack any but the small, tender roots of other sandal plants, which in cases of spike disease are all dead.

HOTSON (J. W.) & STUNTZ (D. E.). **Canker on Chamaecyparis lawsoniana.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1145–1146, 1934.

Heavy losses are stated to be caused among nursery plantings of *Chamaecyparis lawsoniana* in the Seattle district [Washington State] by a stem canker usually occurring just above soil level on the root collar and apparently resulting from wound infections. A species of (?)*Monochaetia* [cf. *R.A.M.*, xii, p. 332] has been isolated from diseased material and inoculated into a number of *C. lawsoniana* seedlings with positive results and recovery of the pathogen.

WRIGHT (E.). **Survival of heart rots in down timber in California.**—*Journ. of Forestry*, xxxii, 7, pp. 752–753, 1934.

The dry summer climate of the Sierra Nevada mountains, California, is not generally conducive to the survival of heart rots in felled timber, but a few instances are cited as evidence that certain fungi persist in a viable state longer than is generally supposed. Thus, the chalky quinine fungus (*Fomes laricis*) [*R.A.M.*, xi, p. 614] was observed on *Pinus ponderosa*, the Indian paint fungus (*Echinodontium tinctorium*) [ibid., xiii, p. 815] on *Abies concolor*, and the incense cedar dry rot fungus (*Polyporus amarus*) [ibid., xiii, p. 200] on *Libocedrus decurrens* under conditions which showed that they had remained viable for many years. In each case the fungus was found near streams or swamps, and some suggestions are made for the rapid drying of felled timber to check the progress of the heart rotting organisms.

VAUGHAN (J. A.). **Creosote plus phosphatide for the production of non-bleeding creosoted Southern Pine poles.**—*Proc. Thirtieth Ann. Meeting Amer. Wood Preservers' Assoc., 1934,* pp. 188–201, 2 figs., 3 graphs, 1934.

The addition of 0·5 to 2 per cent. of phosphatide (lecithin) to commercial creosote has been found to change the viscosity and surface tension of the oil, and to reduce the interfacial tension between the oil and any water with which it may come into contact. The sapwood of the southern pine [*Pinus palustris*] poles on which the writer's experiments were carried out was readily penetrated by the mixture, which has the further advantages of uniform distribution and elimination of any tendency to 'bleeding' or exudation of liquid creosote.

The poles are first steamed at 259° F. for a sufficient time to produce a temperature of 212° at a depth of 2½ in., after which a vacuum equivalent to 24 in. of mercury is maintained for two to three hours. The creosote-phosphatide mixture is then applied by a modified Rueping treatment [*R.A.M.*, xii, pp. 70, 670] into which an air bucking period is introduced to aid distribution and lower the surface concentration of the creosote. This is followed by a second vacuum, completing the first stage of the treatment.

The second stage consists of a Bethell treatment in which water is

introduced into the timber under vacuum to produce a lower humidity and creosote concentration gradient in the poles, thereby retarding moisture losses and minimizing cracking. This method is stated to have given consistently satisfactory results, the surfaces of the treated poles being clean, smooth, and of a pleasing shade of brown.

A discussion (pp. 201–205) followed this paper.

KINBERG (W.). **Die Konservierung des Fichten- und Tannenholzes.** [The preservation of Spruce and Fir wood.]—*Chem. Zeit.*, lviii, 83, pp. 839–841, 2 figs., 1 diag., 1934.

Technical details are given of the writer's improved method of timber impregnation by a combination of injection and kyanization [*R.A.M.*, xiii, p. 667], known as the 'Impf'- or 'Injecto-kyanverfahren', which is stated to be particularly suited for the treatment of spruce and fir poles.

WELLMAN (F. L.). **Occurrence of Cabbage yellows in Cuba.**—*Plant Disease Reporter*, xviii, 11, p. 134, 1934. [Mimeographed.]

A few cabbage plants in Havana Province, Cuba, were found in April, 1934, to be affected by yellows (*Fusarium conglutinans*) [*R.A.M.*, xiii, p. 557], which was stated to have caused considerable damage in the previous year. In a severe form the disease appears to be confined to sandy, dark-coloured soils.

LARSON (R. H.). **Wound infection and tissue invasion by Plasmodiophora brassicae.**—*Journ. Agric. Res.*, xlix, 7, pp. 607–624, 8 figs., 1934.

This is a detailed report of the author's studies at Madison, Wisconsin, of infection of cabbage and other related crucifers by *Plasmodiophora brassicae* and of the reaction of the host tissues to the organism [cf. *R.A.M.*, xiii, p. 140]. In cabbage plants wounded either by the removal of the leaf petioles or by needle punctures and planted in infected soil, spindle-shaped tumours developed only on the hypocotyl (which has a root-like structure) and root, while the tumours which developed in the wounded area of the upper stem were distinctly spheroid galls; a somewhat intermediate type (a spindle with a gall at its thickest portion) was produced on the first internode of the stem. The experiments also gave conclusive evidence that infection of the hypocotyl and stem can only occur through wounds or through ruptures in the cortex caused by the development of adventitious roots. The formation of spindle-shaped tumours in the hypocotyl and root was shown to be caused largely by the abnormal proliferation of the invaded cambium; the plasmodia migrate into the undifferentiated cells on either side of the cambium, but the greatest hyperplasia occurs in the cambial cells and phloem initials. In the upper stem nodes, the hypertrophy is chiefly in the cortical tissues, owing to the abnormal multiplication of the diseased collenchyma and cortical cells; the secondary phloem is also considerably involved.

In semi-round and globe varieties of radish and turnip, infection only occurred in the unenlarged tap-roots, while in the long (icicle) varieties, infection and hypertrophy were confined to the lower portion of the storage organ in the area of secondary roots. Infection of the hypocotyl

of the radish was readily obtained by wounding the tissues in infected soil; all the varieties of radish tested were susceptible.

TOMPKINS (C. M.). **A destructive virus disease of Cauliflower and other crucifers.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1136–1137, 1934.

Commercial cauliflower plantings throughout the coastal areas of central California are stated to be widely and severely affected by a virus disease causing 20 to 30 per cent. loss in the field. Severely infected plants were found to be stunted, the dwarfed terminal heads being surrounded by small, distorted leaves showing conspicuous chlorosis (generally confined to the intercostal areas), coarse mottling, and necrotic spotting. The cauliflower virus, which belongs definitely to the low temperature group [cf. *R.A.M.*, x, p. 411; xii, p. 108], is readily transmissible by juice inoculations to the leaves of healthy seedlings, the incubation period under greenhouse conditions (55° to 65° F.) ranging from 12 to 20 days. The disease has been transmitted to cabbage, kale, and annual stock (*Matthiola incana*) [see above, p. 172]. It was also found in commercial kale seed-beds, which may serve as the primary sources of cauliflower infection. Partial control may be effected by the roguing of diseased seedlings before transplanting.

DUNDAS (B.). **Growing powdery mildew on detached Bean leaflets and breeding for resistance.**—Abs. in *Phytopath.*, xxiv, 10, p. 1137, 1934.

For use in inoculation tests, the powdery mildew (*Erysiphe polygoni*) of beans (*Phaseolus vulgaris*) [*R.A.M.*, xii, pp. 2, 495, 673] was continuously propagated on detached leaflets supported on a 10 per cent. sucrose solution in Petri dishes kept in the light at 19° to 21° C. [cf. ibid., xiii, p. 773]. By this method a ratio of 3 resistant to 1 susceptible was obtained in the F_2 progeny of hybrids between resistant (Pinto) and susceptible (Robust) varieties, indicating that resistance to *E. polygoni* in this material is governed by a simple dominant Mendelian factor.

KENDRICK (J. B.). **Seed transmission of Fusarium yellows of Beans.**—Abs. in *Phytopath.*, xxiv, 10, p. 1139, 1934.

The vascular *Fusarium* disease of field beans (*Phaseolus vulgaris*) observed by Harter in the Sacramento Valley, California, in 1929 [*R.A.M.*, viii, p. 349] was shown by the writer's experiments in 1933 with seed grown in steam-sterilized soil to be seed-borne. Semesan at the rate of 2, 4, or 8 oz. and ceresan at 4 oz. per 100 lb. of beans practically prevented this seed-borne infection.

LECLERG (E. L.). **Parasitism of Rhizoctonia solani on Sugar Beet.**—*Journ. Agric. Res.*, xlix, 5, pp. 407–431, 3 figs., 3 graphs, 1934.

The results of the physiological and pathogenicity studies reported in this paper showed that the 78 isolates tested (51 from sugar beet and 27 from potato) of *Rhizoctonia* [*Corticium*] *solani* from various parts of North America differed widely in their rate of growth. The optimum

temperature was between 25° and 30° C. for 4 of the sugar beet isolates and between 20° and 25° for the single isolate from potato which was tested; no growth occurred at 40°, and low temperature (1°) appeared to inhibit the growth of some isolates without causing permanent injury. All the 5 isolates tested grew over a wide range of hydrogen-ion concentration, with an optimum of about P_H 5·6 for one of the sugar beet isolates and P_H 6·2 for the 4 others. In a special series of tests it was shown that the root rot induced in beets by the organism is most active and destructive at soil temperatures between 25° and 33°, and that sugar beets are susceptible to *C. solani* at all stages of growth after germination. The isolates varied widely in their capacity to rot sugar beet slices.

The fact that both in the greenhouse and in the field the sugar beet isolates were conclusively shown to be pathogenic to large sugar beet roots, while the forms from potato were not, is considered to indicate that root rot of sugar beet is probably caused by strains of *C. solani* distinct pathogenically from those that attack potato [cf. *R.A.M.*, xii, p. 133]. The isolates from sugar beet also caused a considerably higher percentage of damping-off of sugar and table beet seedlings than those from potato, but both groups of isolates were about equally destructive to lucerne seedlings. Tests with one sugar beet and two potato isolates showed that the order of virulence of these forms to sugar beet seedlings remained the same with seedlings of certain additional hosts but varied with others, and that all three caused varying degrees of stunting in seedlings of a number of hosts.

MACKIE (W. W.). **Breeding for resistance in Blackeye Cowpeas to Fusarium wilt, charcoal rot, and nematode root knot.**—Abs. in *Phytopath.*, xxiv, 10, p. 1135, 1934.

Blackeye cowpeas in the sandy soils of the interior Californian valleys are liable to severe damage from wilt (*Fusarium tracheiphilum*) [*R.A.M.*, xi, p. 220], charcoal rot (*Rhizoctonia bataticola*) [*Macrophomina phaseoli*: ibid., xi, p. 711], and nematode root knot (*Heterodera marioni*). In the F_1 progeny of crosses between Iron and Blackeye, resistance to all three diseases was dominant, this character being apparently correlated with a dark colour of the leaves. Suberin is known to occur in large quantities in the Iron parent, and its presence is thought to account for the resistance to disease shown by the progeny. Normal methods of segregation and back-crossing to the Blackeye parent have both yielded satisfactory Blackeye types.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Revision of Sugarcane Quarantine No. 15 (foreign).—2 pp., 1934. [Mimeographed.]

The present amendment (1st October, 1934) of Sugar-Cane Quarantine No. 15 of 6th June, 1914, extends the exclusion of all living cane plants or cuttings from foreign countries, except where imported by or under permit from the United States Department of Agriculture, to Porto Rico and Hawaii, and further includes bagasse [the fibrous refuse from sugar-cane mills] under the parts of sugar-cane the importation of which is prohibited.

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MEIJER (C.). **Copper sulphate and Sugar Beets.**—*Versl. Landb. Onderzoek. Rijkslandbouwproefstations*, 40A, p. 152, 1934. [Dutch. Abs. in *Facts about Sugar*, xxix, 12, p. 452, 1934.]

Good control of damping-off of young sugar beets [*Pythium de Baryanum* and *Aphanomyces levis*: *R.A.M.*, vi, p. 649] on low-lying clay soils rich in humus [in Holland] has been obtained by the application to the soil of 50 kg. copper sulphate per hect. either before sowing or as a side dressing with sodium nitrate after emergence. Increases up to 44 per cent. in the yield are reported.

QUANJER (H. M.). **Enkele kenmerken der 'vergelings'-ziekte van Suiker- en Voederbieten ter onderscheiding van de 'zwarte houtvaten'-ziekte.** [Some features of the 'yellowing' disease of Sugar and Fodder Beets in contradistinction to the 'black wood vessel' disease.]—*Tijdschr. over Plantenziekten*, xl, 10, pp. 201–214, 2 figs., 1934. [English summary.]

Since 1910 the writer has observed the 'yellowing' disease both of sugar and fodder beets (more especially the latter) [*R.A.M.*, xiii, p. 10] on the most dissimilar types of soil bearing these crops in Holland, and there seems to be no good reason for associating it with any particular soil, constitutional, or geographical feature. The disorder was first reported from the Haarlemmermeer and Spaarndammer 'polders' [land reclaimed from the sea] in 1929 and 1931, respectively. During the period of the writer's observations there has been a noteworthy extension of fodder beet cultivation in Gelderland.

As a result of conversations between the Inspector of Agriculture, the Chief of the Phytopathological Service, and the Director of the Sugar Beet Cultivation Institute in 1929, Hudig's name of 'Zealand disease' was replaced by 'yellowing' [ibid., x, p. 488]. Brandenburg, however [loc. cit.], confused the yellowing of beets with another disorder associated with a *Pythium*. At first he thought this was connected with the reclamation disease but later [ibid., xiii, p. 57] recognized that the latter resulted from copper deficiency. For the disease associated with *Pythium* the name 'black wood vessel disease' is here proposed as descriptive of one of its most prominent symptoms. This

disease is confined to sandy soils and is reported to cause a heavy reduction in the sugar yield.

In yellowing disease the yellowing of the practically full-grown beet leaves generally begins at the leaf tips, extending along the margins and between the larger side veins. At the inception of the disturbance the outer three to eight leaves are still green, the next within these are beginning to turn yellow, while the innermost ones again are of normal appearance. The affected leaves are usually rather shorter, broader, thicker, less flat, and more brittle than healthy ones. As the new leaves expand they also become similarly involved. Towards the latter part of the summer the yellowing leaves, then including the outermost leaves of the plant, develop large necrotic areas on which various black moulds develop.

In the secondary phloem of the diseased leaves a number of the sieve-tubes and companion cells undergo a process that may be termed gummosis. In contrast to the Californian curly top, in which the hypertrophy and hyperplasia of the pericycle and phloem are followed by the exudation of a viscid liquid and by extensive necrosis of the roots [ibid., xiii, pp. 558, 675], the morbid process in yellowing affects only certain groups of sieve-tubes and companion cells. The yellow 'gum' produced in the course of degeneration occupies the entire lumen of each of the affected elements, the walls of which become yellow and sometimes swell, so that the dense contents contract into a small central mass. No exudate is formed, and no abnormality is apparent to the naked eye in root sections. The gummosis extends continuously through the leaf veins and petioles down to the vascular rings of the swollen root ('bulb') and even to the bundles of the root tips and lateral roots; it is absent from the youngest (outermost) vascular rings and also (except possibly in an incipient state) from the youngest lateral roots.

The starch formed during the day in yellowing leaves does not, as in healthy ones, disappear during the night, a period of five successive days with total exclusion of light being required for depleting the starch in September. Once free from starch the affected leaves resume photosynthesis on a limited scale but after three days the accumulation recommences. The removal of starch is normally due to two essential processes, respiration and translocation, and tests showed that the latter process is inhibited in the yellowed leaves. The starch accumulation, therefore, appears to be due to impeded translocation associated with gummosis of the phloem. It has not yet been possible, however, definitely to place the yellowing disease of beets in the group of virus disorders characterized by phloem occlusion and consequent starch accumulation.

KENDRICK (J. B.). **Bacterial blight of Carrot.**—*Journ. Agric. Res.*, xlix, 6, pp. 493–510, 8 figs., 1934.

This is an account of a bacterial disease of carrots commercially grown for seed in the upper delta region of the Sacramento Valley, California, where it was first observed in 1931, causing considerable damage in certain fields. It recurred in a widespread and severe fashion in 1932, presumably owing to favourable weather conditions. The disease is characterized by an irregular necrotic spotting on the leaves

and involucral bracts, dark-brown streaks on the petioles, peduncles, and stems, and a blighting of some or all the flowers in the umbels involving a more or less considerable loss in seed yield. So far the disease has not been observed to cause appreciable damage to carrots grown for the market in California.

Isolations from diseased tissues readily yielded a bacterial organism which is considered to be previously undescribed and is named *Pseudomonas carotae*, with an English technical description. It is an aerobic, non-sporulating, non-capsulate, Gram-negative, cylindrical rod with rounded ends, occurring singly or in pairs, measuring 1·38 to 2·75 by 0·42 to 0·85 μ (average 1·95 by 0·59 μ), and provided with one or two polar flagella. On potato-dextrose agar it forms round, smooth, convex or pulvinate, glistening, straw-yellow to massicot-yellow colonies with entire margins; it liquefies gelatine, does not coagulate milk, does not reduce nitrates, has no diastatic action on starch, does not produce indol, and does not form acid from maltose or rhamnose. In beef extract broth it did not grow at hydrogen-ion concentrations of P_H 5·1 or below, but made fair growth at 5·4 and moderate to strong growth at 5·6 to 6·2. It grows at temperatures ranging from 13° to 30° C., with an optimum between 25° and 30°, and thermal death point at 49°. The organism was found to resist freezing in water, and to be able to withstand 204 hours of drying on glass slides.

While some evidence indicated that soil may be a source of infection, the prevalence of floral infection suggests that the seed from diseased plants is chiefly involved in the distribution of the disease. This view is supported by the fact that from 5 to 7 per cent. of obvious infections were obtained in a fairly extensive test, in which plants were raised from seed that had been dipped in a water suspension of the causal organism. Another test indicated that seed from diseased plants does not carry the organism internally.

DOWSON (W. J.). **Phytophthora megasperma Drechsler in Tasmania.**—*Trans. Brit. Mycol. Soc.*, xix, 1, pp. 89–90, 1934.

A very brief account is given of a serious black rot which developed in bagged carrots grown in Tasmania during their transit to Sydney, New South Wales, in April and May, 1931, a season which was abnormally wet in Tasmania. Isolations from diseased carrots yielded a *Phytophthora* identified by S. F. Ashby as *P. megasperma* [*R.A.M.*, xii, p. 466] which under controlled conditions reproduced a slow rot similar to the one occurring in nature when inoculated on slices of young, fresh carrots kept moist at 25° C.; no infection, however, was observed when portions of mature carrots were inoculated and none was obtained through the unwounded surface. The trouble did not recur in 1931–2, when the season was much drier than in the previous year.

JONES (L. K.). **Tobacco mosaic on Spinach.**—Abs. in *Phytopath.*, xxiv, 10, p. 1142, 1934.

Mechanical juice inoculations on Bloomsdale Savoy spinach [? in Washington State] with tobacco mosaic virus No. 1 [*R.A.M.*, xiv, p. 197] gave 50 to 90 per cent. infection after 16 to 20 days' incubation. The first symptom of the disease is a mottling of the older foliage with slightly

raised dark green areas in the paler green tissue. At a more advanced stage the leaves become increasingly puckered and general dwarfing is observed. Yellowing of the older foliage is followed by death a month to six weeks after inoculation.

Tompkins (C. M.) & Gardner (M. W.). **Spotted wilt of head Lettuce.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1135–1136, 1934.

Head lettuce in some of the coastal districts of California is severely affected by tomato spotted wilt [*R.A.M.*, xiv, p. 201], which causes slight marginal wilting, necrotic spotting, and yellowing of the leaves, generally on one side of the plants. Many leaves develop lateral curvature. Infection may take place at any age. All varieties observed, including romaine [cos lettuce], are susceptible to the virus, which has an incubation period of 10 to 25 days. The lettuce virus produced typical spotted wilt in tomato and vice versa, cross-inoculations being also successful with several other known hosts of the virus. Local lesions have been produced on snapdragon [*Antirrhinum majus*] and broad bean [*Vicia faba*] and systemic infection on lettuce by inoculation from Calla lily [*Zantedeschia aethiopica*].

Reusrath (T.). **Die durch den Erreger 'Olpidiaster radicis' in der Gurkenfrühtreiberei hervorgerufene Blattwelke und deren Bekämpfung.** [The leaf wilt of forced Cucumbers caused by *Olpidiaster radicis* and its control.]—*Obst- und Gemüsebau*, lxxx, 10, p. 152, 1934.

During the last three years a sudden wilting of the foliage of forced cucumbers has caused increasingly heavy losses to market-gardeners in the Glückstadt district of Schleswig-Holstein, to which the disease appears to be restricted. Wilting begins between April and June in the basal leaves, whence it spreads to the stems, partially or totally destroying the plants and in any case rendering their yield negligible. The causal organism, *Olpidiaster* [*Asterocystis*] *radicis* [*R.A.M.*, viii, p. 282], may be controlled by the application to the soil in the plant beds of 60 gm. uspulun per cu.m., if necessary supplemented by watering the soil round the plants with a 0·5 per cent. uspulun solution, of which each should receive 2 l., this application being repeated after a week.

Chevalier (A.). **Les maladies et les ennemis de l'Arachide.** [Diseases and pests of the Groundnut.]—*Rev. de Bot. Appliquée et d'Agric. Trop.*, xiv, 156–157, pp. 709–755, 4 pl., 4 figs., 1934.

This paper constitutes the sixth chapter of the author's monograph of the groundnut, and deals at some length with the chief fungal, bacterial, and virus diseases, and insect pests of the crop, which have been so far recorded in literature or personally observed by him. The list of the fungal diseases includes, among others, black spot caused by *Cercospora personata* [*R.A.M.*, xiii, p. 74], which is stated to occur wherever the groundnut is cultivated, and which was also found on several wild species of *Arachis* indigenous in Brazil, namely, *A. glabrata*, *A. marginata*, *A. villosa*, *A. tuberosa*, *A. pusilla*, and *A. rasteiro*, preserved in the Herbarium of the Museum in Paris; rust caused by *Puccinia arachidis* [ibid., xii, p. 246]; root rots due to several species of *Rhizoctonia* or *Corticium*; and foot and root rot caused by *Sclerotium rolfsii*

[ibid., xii, p. 357]. Mature groundnut pods are attacked by moulds and other fungi which may sometimes penetrate deeply into the living tissues. Among the latter, an account is given of an apparently hitherto undescribed fungus which was found forming a whitish mycelial weft on pods grown in Paris, and which is named *Cercosporella cylindrospora* Heim (with a French diagnosis). It is characterized by long cylindrical, subhyaline, 5- to 7-septate conidia, slightly tapering towards the base and rounded at the apex, and measuring 52 to 65 by 10 to 14 μ; they are borne on erect, cylindrical, septate conidiophores, 3·5 to 4 μ in width.

Le Champignon de couche. Sa biologie. Ses ennemis. [The cultivated Mushroom. Its biology. Its enemies.]—vii+130 pp., 7 pl., Société Le Champion, 27, rue de Dijon, Bordeaux, 1934.

The primary aim of this useful booklet, written in popular language, is to promote the use by commercial growers of the cultivated mushroom (*Psalliota campestris*) of the spawn produced under controlled conditions by the publishers. After a very brief account of the biology of the mushroom, practical advice is given for the proper installation and working of the beds, particularly in disused quarry galleries, such as are commonly used for this purpose in the neighbourhood of Paris [cf. *R.A.M.*, xiv, p. 74]. This is followed by some recommendations for the prevention of the introduction of parasitic diseases into the mushroom-growing premises, and the book terminates with brief accounts of the principal bacterial and fungal troubles and insect pests of the crop in France, the control of which is briefly discussed in each case.

Du Plessis (S. J.). **Botrytis rot of Grapes, and its control during 1933–34.**—*Farming in South Africa*, ix, 103, pp. 395–397, 2 figs., 1934.

An account is given of a series of experiments conducted during 1933–4 in the control of *Botrytis* [*cinerea*], the losses from which among South African grapes in storage and transport are stated to have been immense during recent years [*R.A.M.*, x, p. 703]. The field trials were carried out at Constantia on the highly susceptible Henab Turki variety and to a lesser extent on Red Hanepoot, while the complementary laboratory investigations were made at Stellenbosch.

The experimental grapes were picked as usual, placed in cold storage for three weeks, and then transferred to ordinary room temperature for one or two weeks, after which counts of infection by *Botrytis*, *Penicillium*, and *Rhizopus* were made. In this way a total of 700 boxes was used and nearly half a million grapes individually examined. The vines from which the grapes came were treated only once for the early crop, and where a late crop was obtainable a subsequent dusting or spraying was given. Infection by *Botrytis* was generally slight in the vineyards, and only in three experiments was it possible to determine the relative effects of the various treatments of the incidence of the disease. Copper sulphur dust (capex) proved superior to zinfandelite, sodium sulphite and kaolin, copper-lime dust (springbok), cupric sulphur, cuprite, bouisol [ibid., xiv, p. 200], and sulsol. The best control of the fungus in storage was also given by capex, closely followed by verderame sulphur dust (copper-oxide-chloride), the latter, however, being used only on

one farm. Neither of these compounds is actually deleterious from the standpoint of human consumption, though care in their use is indicated. Cupric sulphur gave moderately satisfactory results. Bouisol and sulsol were ineffective, adhesion being very poor and the appearance of the fruit liable to be spoilt, notably in the case of Henab Turki and Gros Colman. A distinct discoloration of Red Hanepoot berries was caused by cupric sulphur and to a much slighter extent by capex, which did not, however, adversely affect Henab Turki. It appears, from a preliminary investigation of the times of treatment and picking in relation to disease, that the dusts should be applied as shortly as possible before rain and the fruit picked as long as practicable (preferably about three days) after rain from 12 noon towards sunset, packing being left until next day. None of the three dusting machines used gave entirely satisfactory results, but the 'Original Gun' complied with most of the requirements. The preservation of the bloom on the fruits was found to be of great importance in the adhesion of the dusts.

The addition of 0·2 gm. of ammonium carbonate per bunch before wrapping [cf. ibid., xiv, p. 30] gave effective control of *Botrytis* and left practically no chemical favour. Sodium metabisulphite was also fairly satisfactory as a preventive of storage rot but bleached the fruit considerably and left a decided taste of sulphur [cf. ibid., xiii, p. 426]. The use of wrappers impregnated with 5 per cent. each of copper sulphate, potassium iodide, or ferric sulphate, and with 1 per cent. potassium permanganate produced only a temporary retardatory action on the rot.

Zacharewicz (E.). **Traitement pour combattre en même temps la brunissure et la chlorose de la Vigne.** [Combined treatment against Vine 'brunissure' and chlorosis.]—*Prog. Agric. et Vitic.*, cii, 43, pp. 423–424, 1934.

As a combined treatment against vine 'brunissure' [*R.A.M.*, xii, p. 676; xiii, pp. 492, 616] and chlorosis [ibid., xiii, p. 745] a mixture consisting of 25 kg. dehydrated iron sulphate and an equal amount of potassium nitrate in 100 l. water, applied as a paint to the pruning wounds, gave satisfactory results.

Săvulescu (T.), Sandu-Ville (C.), Rayss (T.), & Alexandri (V.). **L'état phytosanitaire en Roumanie au cours de l'année 1932–1933.** [Phytosanitary conditions in Rumania during the year 1932–1933.] —*Inst. Cerc. Agron. al Romăniei*, 12, 93 pp., 15 figs., 1 map, 1934. [Rumanian, with French translation.]

In 1932 infection of wheat in Rumania by *Puccinia triticina*, *P. glumarum*, and *P. graminis*, especially the first, continued during November and December. As in previous years, *P. triticina* overwintered by uredospores and resting mycelium, though *P. glumarum* and *P. graminis* failed to survive [*R.A.M.*, xiii, p. 152]. Late-sown winter wheats escaped autumn infection and developed no spring infection by *P. triticina*, spring wheats also remaining unaffected until later in the year. The rusts were favoured by cold, wet weather early in June 1933, when the thermohydric predisposition index [ibid., xiii, p. 690] was high (9·4), and a second infection period was induced by a cold,

wet spell during the first ten days of July, when the predisposition index reached 10·5, its highest point. Owing to the susceptible state of the wheat and the favourable weather, *P. glumarum* and *P. graminis* appeared on the leaf blades, sheaths, stems, and ears. The varieties least attacked (and therefore least susceptible to cold and rain) were American 15 and 26 [ibid., xii, p. 426], which were also very resistant to *Ustilago tritici* [cf. ibid., xii, p. 549]. After the attack of the previous year, the teleutospores of *P. graminis* were found in the soil to the number of 4 per sq. cm. or 400,000,000 per hect.; in May 1933 they germinated and carried heavy infection to barberries [cf. ibid., xii, p. 427; xiii, p. 152], which sustained the most severe attack ever recorded in Rumania. All areas became affected, and in one locality between 15th and 20th May 50 aecidia could be counted on a single leaf. Wheat fields surrounded by barberry bushes sustained heavy losses from black rust, which, however, became progressively less the farther the fields were from the alternate host [ibid., xiv, p. 88].

Wilted wheat seedlings showed infection by *Fusarium culmorum*, which was also present on maize roots, though, especially in fields weeded promptly, it caused less damage to this host than to wheat. The barley varieties most resistant to *U. nuda* were Hanna and Isaria, the most susceptible being Local neselectionat. Rye ergot (*Claviceps purpurea*) was very prevalent, and in one locality caused losses of 70 to 90 per cent.

Sunflowers in Bessarabia were attacked, chiefly at the base of the stem, by *Sclerotium complanatum* Tode, while *S. omnivorum* Van der Wolk was found on the stems, roots, and fruits of groundnuts. Chick pea anthracnose (*Ascochyta rabiei*) [ibid., xiii, p. 612] was present in practically every district where this host is grown. A partial chlorosis of eggplants with mottling and dwarfing of the leaves and a mosaic leaf mottle of chilli pepper [*Capsicum annuum*] are attributed to a virus. The latter host was also attacked by *Actinomyces todschlidowskii* Serb., which in some cases caused appreciable losses; the infection sites became re-infected later by *Alternaria capsici-annui* Săvul. & Sandu. Lettuces near Bucharest were widely attacked by *Aecidium lactucae-sativae* Syd., but although the attack was occasionally very active it was confined to two or three outer leaves; the losses sustained were slight and confined to a few localities.

Apricot apoplexy [ibid., xii, p. 227] was much more widespread than before. The disease, which has been present for a few years in Rumania, is attributed to (1) external predisposing factors, i.e., adverse weather, unsuitable soil, and unsatisfactory cultural conditions, (2) internal predisposing factors, i.e., gum accumulation in the vessels, with resultant asphyxiation, and (3) attack by weak parasites. It appears at the beginning of summer and the trees, which are then in active growth, wither, the leaves on a few or all of the branches turn yellow in two or three days and gum exudation ensues. A transverse section from an affected branch shows a brown discoloration of the cortex, cambium, and adjoining wood. The condition may cause from 30 to 50 per cent. loss.

Elm die-back (*Ceratostomella ulmi*) [ibid., xii, p. 666; xiv, p. 133] was prevalent throughout Rumania.

SIMMONDS (J. H.). **The work of the Pathological Branch.**—*Ann. Rept. Queensland Dept. of Agric. & Stock for the year 1933–1934*, pp. 67–70, 1934.

The following are some of the records of phytopathological interest contained in this report. During the period under review, blue mould (*Peronospora tabacina*) [*R.A.M.*, xiii, p. 214; xiv, p. 200] was an important factor in reducing the tobacco area in Queensland, where L. F. Mandelson obtained good commercial control with seed-bed applications of copper emulsion and colloidal copper [ibid., xiii, p. 332].

As in the previous season, speckle [ibid., xiii, p. 215] equalled or even surpassed leaf spot (*Cercospora musae*) as a cause of defoliation of bananas.

Under dry summer conditions in Queensland infection of Emperor mandarin oranges by black spot (*Phoma citricarpa*) [loc. cit.] becomes progressively worse from flowering time until January, but control can be effected by applications of Bordeaux mixture made during blossoming and again in December.

Wilt remains the major disease of pineapples [ibid., xii, p. 530]. Tests in sulphur-treated field plots showed that highly beneficial results may be expected if the acidity of fertile soils is increased. Pineapple black heart, which laboratory and cold storage tests indicated may be due to abnormal transpiration, was very serious in the late winter crop. Fruitlet core rot [ibid., viii, p. 53; xiv, p. 181] also caused heavy losses during the canning of the winter crop. Investigations largely confirmed the view that the disease is due to a *Penicillium*, the entry of which, through the walls of the floral chamber, is made possible chiefly by the activities of the pineapple mealy bug [*Pseudococcus brevipes*] and a Tarsonemid mite. The pineapple bacterial diseases known as 'marbled fruit' and 'pink' disease, originally recorded from Hawaii, were reported in Queensland for the first time; the former is of minor importance, but the latter may be serious, as the discoloration does not appear until after canning and boiling the fruit.

Papaw powdery mildew, caused by a species of *Sphaerotheca*, is most serious in late winter, when it may produce withering of the crown leaves and a grey scurf on the fruit. Black spot [ibid., xiii, p. 215] appears on the same host in late winter and lasts until summer, causing shedding of the flowers and young fruit, a black spot on the mature fruit, and a serious stem decay. This disease is associated with *Ascochyta caricae*, inoculations with pure cultures of which reproduced the condition. Inoculation tests showed that a species of *Phytophthora* associated with papaw crown rot was pathogenic [cf. ibid., xii, p. 77]. Transport rots of ripe papaws are usually associated with *A. caricae* and a *Gloeosporium*. In attempts to find the transmitting agent of yellow crinkle [ibid., xi, p. 157] inoculations by means of insects and the usual mechanical methods gave negative results.

Field trials with watermelon seed obtained by selfing varieties (received from Iowa) resistant to wilt (*Fusarium*) [*niveum*: ibid., xii, p. 495; xiii, p. 560 and below, p. 220] indicated that Iowa King, which combines resistance with desirable commercial qualities, may prove to be a promising substitute for the common susceptible varieties.

Recent research on Empire products. A record of work conducted by Government Technical Departments overseas. Agriculture.—*Bull. Imper. Inst.*, xxxii, 3, pp. 437–467, 1934.

The following items of phytopathological interest occur in this report. J. West, Botanical Section, Southern Provinces, Nigeria, supplies details of spraying and dusting experiments against black pod of cacao [*Phytophthora palmivora*: *R.A.M.*, xiv, p. 87] from 1931–4. The spraying (Bordeaux mixture) was done with knapsack machines and the dusting with a rotary blower, using cupryl. These treatments, combined with clean sanitation, pruning, and thinning, effected an appreciable increase in the yield of both main and mid-season crops besides reducing the incidence of infection, though the latter is stated seldom to exceed 12 per cent. even in the absence of treatment, provided harvesting is regular.

Seventy-seven local and 28 imported varieties of cassava are under investigation at Kumasi, Gold Coast, with a view to the development of a mosaic-resistant type [ibid., xiv, p. 146]. J. West's investigations in Nigeria have shown that this disease is gradually spreading inland from the coast, and as none of the indigenous varieties shows any sign of resistance it is proposed to introduce immune varieties from the Gold Coast, Sierra Leone, and the West Indies, and if necessary, to carry out hybridization experiments between foreign and native types.

A destructive tuber rot of yams [*Dioscorea* sp.] in the Ibadan and Ilorin districts of Nigeria appears to be primarily due to the eelworm *Hoplolaimus bradys*, which paves the way for more extensive infection by fungi (*Rhizoctonia* [*Corticium*] *solani* and *Fusarium oxysporum*) and bacteria. The results of soil analyses indicate that alkalinity and a high organic content are contributory factors in the etiology of the disease, which further appears to decline in yam crops following cereals and cotton.

Martyn (E. B.). **Report of the Botanical and Mycological Division for the year 1933.**—*Divisional Repts. Dept. of Agric. British Guiana for the year 1933*, pp. 105–111, 1934.

During the period under review sugar-cane 'root disease' [*R.A.M.*, x, p. 753] became increasingly prevalent in the Berbice district of British Guiana, though it was rare in West Demerara. It appears with the first heavy showers that fall after a drought and ceases when the affected area is irrigated. Analysis showed that affected shoots contained more chlorine than green, healthy ones, but that both contained about the same amount of magnesium, indicating that the disease is due, not, as was previously thought, to excess magnesium but to an excess of soluble salts, such as sodium chloride, in the soil. In future, the disease is to be referred to as 'salt blight'.

Infection experiments showed that the strain of *Fusarium moniliforme* [*Gibberella moniliformis*] associated with the disease known locally as 'man rice' [ibid., xiii, p. 357] was less virulent than the strain causing a similar disease obtained from Madras. Inoculations of five-months-old ratoons of P.O.J. 2878 sugar-cane with the 'man rice' fungus produced on a few leaves symptoms identical with those described and figured for 'pokkah boeng'.

Further investigation into phloem necrosis of Liberian coffee [*Phytomonas leptovasorum*: loc. cit.] in the North-West District indicated that the age and management of the trees are the main factors concerned in promoting the disease. Trees sixteen years old or over are particularly susceptible. The bad outbreak of 1932 began with the onset of dry weather in September, the trees dying off in large numbers until the rains started again in December; the total loss was approximately 37 per cent.

A bad outbreak of scab (*Sporotrichum citri*), the first record of this disease in the Colony, occurred on Seville orange seedlings. The affected plants were destroyed and the remainder sprayed regularly with Bordeaux mixture, with the result that by the end of the year the disease appeared to have been stamped out.

Mosaic disease was observed on tomato varieties at Whim sub-station on the Corentyne coast, the affected plants showing the fern-leaf type of distortion [ibid., xiv, p. 132]; the Early Market variety was rather less severely affected than Marglobe.

Cowpeas at the Cecilia sub-station were attacked by mosaic [ibid., ix, pp. 187, 666].

SHEPHERD (E. F. S.). **Diseases of garden plants and fruit trees in Mauritius.**—*Mauritius Dept. of Agric. Bull.* 43 (*Gen. Ser.*), 16 pp., 1934.

Popular notes are given on a number of well-known fungous, bacterial, and virus diseases affecting fruit, vegetable, and miscellaneous crops in Mauritius, supplemented by directions for the preparation of some standard fungicides.

Division of Botany.—*Fifty-third Ann. Rept. New York (Geneva) Agric. Exper. Stat. for the fiscal year ended June 30, 1934*, pp. 24–32, 1934.

This report, which is on the same lines as those for previous years [cf. *R.A.M.*, xiii, p. 357] contains, among others, the following items of phytopathological interest. During the first year's extensive tests with red [cuprous] oxide of copper dust as a fungicide [ibid., xiv, p. 151] for seed and foliage treatment it appeared to give control of apple scab [*Venturia inaequalis*] and certain vegetable diseases, such as tomato late blight [*Phytophthora infestans*]; it is being tested on a wide range of fruit, vegetable, and flower diseases. It is believed that its injurious effect on the host plants can be eliminated by a new manufacturing technique that is being evolved.

During 1933 red raspberry mosaic [ibid., xiii, p. 357] remained the most prevalent single virus disease of raspberries in the State, though yellow mosaic [ibid., vi, p. 676] increased significantly. The importance of brambles as disseminators of virus diseases becomes every year more marked, especially as regards wild and escaped red raspberries which are common in woods and fence rows near cultivated plantings. The value of eradicating wild red raspberries near cultivated varieties was twice demonstrated. Further inoculation experiments on caged and uncaged black raspberries [*Rubus occidentalis*] confirmed previous results in showing that the mild mottling universally present in Columbian purple raspberries [*R. neglectus*: ibid., xiii p. 358] is an expression of red raspberry mosaic. Plantings of this resistant purple variety, however

vigorous and productive they may be, are a menace to healthy but susceptible raspberries growing in the vicinity. Several new varieties of black raspberries reputedly free from virus diseases in various parts of the eastern United States failed to show any marked immunity when exposed to natural infection in four localities in the intensive raspberry-growing area of western New York.

The new Naples variety of black raspberries appears to be highly resistant to anthracnose [*Elsinoe veneta*: ibid., xiv, p. 181], and it is confidently anticipated that it will become of commercial prominence. The Quillen variety, practically unaffected in Indiana, is to be tested for resistance at Geneva.

Combined germination and disease tests made on some 2,500 stocks of canning crop and vegetable seeds showed that peas grown in the western areas of New York were relatively free from the common seed-borne diseases; species of *Ascochyta* and *Fusarium* developed on a few samples of imported peas and those grown in the eastern parts of New York.

An examination of 600 examples of oats from all parts of New York showed that many carried an *Alternaria* which was not, however, injurious to the seedlings; *Helminthosporium avenae-sativae* [*H. avenae*: ibid., xii, p. 162] and *Erwinia* [*Bacillus*] *avenae* [ibid., x, p. 10] were also present, causing root rot. Vetch seed from seven European countries and several places in the United States carried from 1 to 15 per cent. infection by *Ascochyta viciae* [cf. ibid., ix, p. 273]; the stems of vetch seedlings were killed by a new disease due to a *Rhizoctonia*.

Sixth Biennial Report of the Michigan State Department of Agriculture for the fiscal years ending June 30, 1933 and June 30, 1934.—130 pp., 5 figs., 2 maps, 1934.

This report contains the following items of phytopathological interest. As a result of the eradication of 6,000,000 common barberry bushes in Michigan and twelve other north-central grain-producing States since 1918, the average loss from stem [black] rust of cereals [*Puccinia graminis*] was reduced to a trace (0·3 per cent.) in 1933 as compared with the average of 1,657,000 bushels (5 per cent.) per annum from 1916–33 [*R.A.M.*, xii, p. 203]. It is estimated that the barberry eradication campaign, the annual cost of which is less than $300,000, has already been the means of saving $20,000,000 each year to grain-growers in the thirteen participating States. During the period from 1st July 1932 to 30th June 1934, 153,035 bushes were destroyed on 1,241 properties, very valuable assistance in the work having been rendered by the staffs and pupils of schools and colleges.

Very careful inspection is stated to be necessary to deal with the increasing incidence of pests and diseases of bramble fruits. During the period under review some 2,000 acres of raspberries were annually examined and the diseased plants rogued out, special attention being paid in 1932 to the distribution of crown gall [*Bacterium tumefaciens*: ibid., xiv, p. 180].

The percentage of virus diseases (red suture, rosette, littles, and yellows) of peach [ibid., xii, p. 203; xiii, p. 563] in the summers of 1932 and 1933 was 4·6 and 1·4, respectively.

In the course of the biennium two counties were added to those known to be infested by white pine [*Pinus strobus*] blister rust [*Cronartium ribicola*], one in the Upper and the other in the Lower Peninsula [ibid., xii, p. 203; cf. also xiii, p. 208] and a considerable extension of the disease was observed in the areas already under investigation. The total number of *Ribes* eradicated during the period under review (inclusive of the second campaign in three counties and of the third in one) was 7,478,182. Nursery sanitation work, consisting in the removal of all wild and cultivated currant and gooseberry bushes within 1,500 ft. of the nursery, and of black currants within one mile, was carried out in four localities covering a total area of 961 acres, on which the number of bushes eradicated amounted to 88,350. The total number of black currant bushes eradicated in the 40 infested counties of the Lower and the 10 of the Upper Peninsula from 1932–4 was 37,407.

Botany and plant pathology section.—*Ann. Rept. Iowa Agric. Exper. Stat. for the year ending June 30, 1934*, pp. 64–80, 1 fig., 1934.

This report for 1933–4 [cf. *R.A.M.*, xiv, p. 149] contains among others the following items of phytopathological interest. Watermelon varieties resistant to wilt [*Fusarium niveum*: ibid., xiv, p. 143] which will meet the most critical demands of the grower and consumer are rapidly being evolved from the segregates obtained by J. J. Wilson in crosses between susceptible varieties and the resistant Iowa Belle.

Four physiologic forms of *Puccinia coronata avenae* [*P. lolii*] not previously identified were isolated by H. C. Murphy from collections made in 1933, bringing the total number of known forms to 37. Forms 33 and 34 are able to attack the hitherto highly resistant Bond variety of oats; the last-named was collected in Louisiana and the adjoining States in 1933, but form 33 has not yet been isolated from field collections. Oat plants infected with crown rust yielded less grain, straw, and roots than uninfected ones. Except where the yield of grain was entirely inhibited, the weight of roots was reduced most, and that of the straw least. The ratio of roots to tops was greatly decreased, in proportion to the duration and severity of the rust infection. Susceptible plants first infected in the seedling stage used 290·8 per cent. more water per unit of dry weight than rust-free plants, while resistant plants used only 39·9 per cent. more. Oat plants infected with *P. lolii* or stem rust [*P. graminis avenae*] were far more susceptible to frost injury than rust-free plants.

In a test by W. J. Henderson evidence was obtained that it is unprofitable to grow sugar beets two years in succession when leaf spot (*Cercospora beticola*) is present, as the disease is carried over in the field from the previous crop and causes severe damage. The initial infection in the author's experiment came from the soil.

A severe canker of one- and two-year old cherry stock was tentatively attributed by G. L. McNew to *Bacterium pruni* [ibid., xiv, p. 178]. The disease was particularly severe on Black Tartarian, Bing, and Early Richmond, but was not found on Mahaleb stocks, and was very uncommon on Montmorency.

For the second consecutive year I. E. Melhus observed that *Diplodia zeae* was able to invade the crown of maize plants from infected soil.

Plants growing in infected soil the moisture content of which was either extremely high or extremely low became heavily infected, their dry weight falling to 65 per cent. of normal. In seed disinfection experiments by C. S. Reddy with twelve commercial and new dust fungicides the increases in the yields from dusted maize seed infected with *D. zeae* averaged 8·9 bushels per acre, the corresponding figure for dusted, but almost disease-free seed being 2·7.

When one-year-old white ash [*Fraxinus americana*] trees were inoculated (through wounds) with *Dothiorella fraxinicola*, three months later large, swollen cankers developed, with immature fruiting bodies forming subepidermically in the dead bark; similar inoculations with *Cytospora annularis* (which a survey showed was the fungus most commonly present on white ash in Iowa) demonstrated that this was the most virulent of the organisms tested, causing pronounced sunken cankers with swollen margins round the wounds. The fungus killed the tissue beyond the wound, and in young branches practically girdled the tree.

Forty-sixth Annual Report of the Arkansas Agricultural Experiment Station for the fiscal year ending June 30, 1934.—*Arkansas Agric. Exper. Stat. Bull.* 312, 63 pp., 1934.

Preliminary experiments with detached portions of cotton plants resistant and susceptible to wilt (*Fusarium vasinfectum*) indicate that the character for resistance is not localized in the roots but is found also in the aerial organs. The movement of the fungus through the vascular system is much more rapid in the stems of susceptible plants than in those of resistant ones, and the latter apparently contain a substance capable of inhibiting the growth of the pathogen in culture. The incidence of cotyledonary infection by *Bacterium malvacearum* on cotton seedlings was considerably reduced by early (end of April and beginning of May) seed treatments with ceresan and new improved ceresan, but by mid-season no difference in the amount of angular leaf spot could be detected on the various plots.

Further investigations by H. R. Rosen on apple and pear fireblight [*Bacillus amylovorus*: *R.A.M.*, xii, p. 699; xiv, p. 110] indicated that, under Arkansas conditions, the pathogen does not remain viable as long as in the cooler climates of the northern United States and Canada. In Bartlett pear shoots it apparently failed to survive the winter of 1933–4 on the exposed surface of diseased material. A new copper phosphate compound was found to be equally effective with Bordeaux mixture 1–3–50 in the control of *B. amylovorus*.

A *Sclerotium* which is the agent of a serious rot of potatoes, cantaloupes, and other cultivated plants, has been isolated by the same worker from common crabgrass [*Panicum sanguinale*] and ragweed (*Ambrosia artemisifolia*).

Most of the blighting of rice observed in 1933 was found by E. M. Cralley to be due to species of *Fusarium* and *Rhizoctonia* [*Corticium*] *solani*, though *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: ibid., xiii, p. 800] and *Pythium* sp. were also involved to some extent and *S. rolfsii* was isolated from diseased seedlings collected in Louisiana. Stands of the Supreme Blue Rose variety were benefited and the yields increased by some 5 bushels per acre by seed treatment with formalde-

hyde, ceresan, and copper-lime dust. In maize meal agar cultures, the germination of rice smut (*Tilletia horrida*) spores [ibid., xiii, p. 653] was by a non-septate promycelium, 10 to 300 by 5 to 8 μ. The primary sporidia, numbering 30 to 50, are cylindrical, usually curved, formed in whorls at the promycelial tip, and measuring 35 to 55 by 2 μ; they may produce secondary sporidia directly or indirectly on a mycelium. E. M. Cralley and E. C. Tullis found *Sclerotium hydrophilum* associated with a rice disease, the symptoms caused being mild and the only external evidence of infection the occurrence of white, later dark brown, spherical, sometimes elliptical or dumb-bell-shaped sclerotia, 350 to 850 μ in diameter, in the outer leaf sheaths. Other hosts of the fungus are *Echinochloa* [*Panicum*] *crus-galli*, *E. colona* [*P. colonum*], and *Typha latifolia*.

The Forty-seventh Annual Report of the Colorado Agricultural Experiment Station for the fiscal year 1933–34.—28 pp., 1934.

The following items of phytopathological interest occur in this report. One strain of Turkestan lucerne has been found resistant to bacterial wilt [*Aplanobacter insidiosum*: *R.A.M.*, xiv, p. 174] but it lacks certain desirable fodder qualities, is a relatively low yielder, and is subject to various other diseases. Progress is being made, however, in the development of lines combining resistance with productivity.

Where the foot root of wheat due to *Helminthosporium sativum* [ibid., xiii, p. 758] constitutes a problem, planting in fairly cool soil about 15th September has been found to give practically complete control, e.g., in the Akron district.

A pepper [*Capsicum annuum*] wilt caused by *Phytophthora capsici* [ibid., xii, p. 535] is under investigation to determine the conditions governing infection and the occurrence of varietal resistance.

Field spraying for purple blotch of onions [ibid., xiii, p. 151] has resulted in a decrease of the losses from 42 to 7 per cent.

A species of *Sclerotinia* caused considerable damage to Chinese elm [*Ulmus* (?) *campestris* var. *chinensis*] seedlings in the spring, attacking the roots and stem bases, but it appears to have been controlled by rational sanitation.

Peach mosaic [ibid., xiv, p. 40] was observed in the vicinity of Palisade, necessitating the eradication of diseased trees.

Crown rot and damping-off of *Pyrethrum* [*Chrysanthemum* (?) *coccineum*] caused, respectively, by *Phytophthora* sp. and *Pythium* sp. were controlled by improved cultural practices.

Botany.—*Forty-seventh Ann. Rept. Pennsylvania Agric. Exper. Stat. for the fiscal year ending June 30, 1934* (*Bull.* 308), pp. 15–16, 1934.

In six years' potato-breeding experiments against virus diseases in Pennsylvania [cf. *R.A.M.*, x, p. 85] over 6,000 seedlings have been grown, the result of crossings and self-pollinations, using as parent plants many old, local, naturally resistant varieties. One Cobbler type has been developed which is remarkably resistant.

Attempts to prevent by spraying the appearance of wildfire [*Bacterium tabacum*] in artificially contaminated tobacco field beds were completely successful only when the application of Bordeaux mixture was begun

at seeding time [ibid., xi, p. 497]; copper-lime applied at the same time did not always give plots free from the disease. When plots in which the disease had been present in 1932 were planted with healthy seedlings in 1933, the disease appeared on three out of six plots. It was also found naturally infecting *Physalis virginiana*, and inoculations of tobacco with pure cultures of the organism isolated from this host gave positive results.

MARCHIONATTO (J. B.). **Argentine Republic: plant diseases observed in the country.**—*Internat. Bull. of Plant Protect.*, viii, 11, p. 241, 1934.

Sphaceloma [*Elsinoe*] *piri* [*R.A.M.*, xi, p. 724], hitherto observed only on pear in the Argentine, was detected during 1934 on apple leaves and fruit in the province of Buenos Aires. A species of *Melanconium* (so far unidentified) was found producing cankers on the twigs and branches of *Eucalyptus viminalis* in the same province. Superficial damage to potato tubers from silver scurf (*Spondylocladium atrovirens*) [ibid., xiii, p. 592] was reported for the first time, also from Buenos Aires.

STEYAERT (R. L.). **Résumé du rapport sur l'activité du laboratoire de phytopathologie (Stanleyville et Bambesa) en 1933 et la campagne cotonnière 1933–1934.** [Résumé of the report on the activity of the Stanleyville and Bambesa phytopathological laboratory in 1933 and the Cotton season 1933–1934.]—*Bull. Agric. Congo Belge*, xxv, 3, pp. 376–385, 1934. [Received January, 1935.]

In an experiment conducted in the Belgian Congo in 1933, the bolls from four cotton plants in each of five plots sown at fortnightly intervals from 10th July were collected every week and the percentage amounts of internal boll disease (*Nematospora coryli* and *N. gossypii*) and 'red rot' present were calculated. The latter condition, which is not apparent externally, is a wet, later dry, garnet-red rot, probably of bacterial origin, generally affecting the whole segment; this dries up and the placenta becomes hypertrophied.

The data obtained showed that internal boll disease increased throughout the season, the figures for the five plots being, respectively, approximately 0·7, 0·3, 1·4, 2·4, and 6 per cent., whereas the amount of red rot present remained practically constant at approximately 1 per cent. in the first four plots, but jumped to 3 per cent. in plot 5. These figures refer to the total number of bolls on the plants and include those in all stages of development, from the smallest to those about to open. Internal boll disease occurs in bolls 2·5 cm. in diameter, very occasionally in smaller ones, and never in those under 1·5 cm. in diameter.

Seedling damping-off, caused chiefly by *Rhizoctonia* [*Corticium*] *solani* and, to a very slight extent, by *Sclerotium rolfsii*, was very severe, the percentage infection in the five plots and a later-sown one being, respectively, 7·5, 1·5, 11·7, 7·2, 7·2, and 4·5 per cent. An inverse correlation was established between intensity of infection and increasing soil temperature and sun heat.

In two localities young plants (with six to seven adult leaves) of the newly introduced Dixie Triumph cotton were attacked by angular leaf spot [*Bacterium malvacearum*], though Triumph Big Boll remained unaffected.

Cotton in the vicinity of Wamba-Ibambi developed a wilt [the symptoms of which are described] due probably either to *Fusarium vasinfectum* or *Verticillium albo-atrum*; further investigations into this condition are in progress.

A considerable proportion of the berry borers (*Stephanoderes hampei*) present in coffee plantations were parasitized by *Beauveria bassiana* [*R.A.M.*, x, p. 188]. The highest mortality (66·6 per cent.) due to the fungus occurred in July, the figure rapidly decreasing as harvest-time approached. Laboratory tests indicated that the percentage of infected insects was higher on green than on more mature berries, and that infection was most intense at an atmospheric humidity of about 80 per cent. Locally, nearly all the berries are in the green stage in July, in which month attempts at controlling the insects by dusting or spraying with the spores of *B. bassiana* are to be made.

BRITON-JONES (H. R.). **The diseases and curing of Cacao.**—x+161 pp., 37 figs., London, Macmillan & Co., Ltd., 1934.

In this manual, written as the result of a discussion at the Imperial Mycological Conference (1929) [*R.A.M.*, ix, p. 259] as to the need for a series of hand-books on the diseases of the major tropical crops, the author discusses the symptoms, etiology, and control of all the important disorders of cacao, grouped under the headings of root, stem, and pod diseases, followed by a separate chapter on witches' broom (*Marasmius perniciosus*) [ibid., xiv, p. 87]. A final chapter deals with the 'curing' of cacao, the widely scattered literature on which is often difficult of access. Throughout the book, to which a bibliography of 192 titles (in addition to a special one of 40 titles dealing with curing) is appended, the author has sought to avoid the use of technicalities, since the chief objects of the agricultural officers and planters, for whom it is primarily intended, are the detection of a disease by its macroscopic symptoms in the field and the knowledge of practicable control measures. On this account, the work is exceptionally full in its treatment of the more practical aspects of cacao disease control by improved methods of cultivation and other measures directed towards securing a vigorous stand. It is thus one which all those who are concerned with the crop, whether as growers or members of tropical agricultural departments, will find very valuable. In the sections dealing with diseases such as pod rot and canker (*Phytophthora palmivora*) and witches' broom, stimulating reflections based on the author's personal observations and those of his colleagues in Trinidad will interest plant pathologists who are concerned with the diseases of tropical perennial crops.

Mention should be made of the excellent photographic reproductions illustrating the work.

YAKOUBTZINER (M. M.). Пшеница устойчивая против грибных заболеваний. (**Triticum Timopheevi Zhuk.**). [A Wheat resistant to fungal diseases (*Triticum timopheevi* Zhuk.).]—*Bull. of Appl. Bot., Genetics, and Plant Breeding*, Leningrad, Ser. A (*Plant Industry in U.S.S.R.*), 11, pp. 121–130, 1 fig., 1934.

The chief purpose of this note is to draw the attention of wheat-breeders to a species of emmer wheat [the botanical characteristics and

genetical affinities of which are discussed in some detail] which was described in 1928 by Zhukovski [Joukovsky] under the name *Triticum timopheevi* (*Bull. of Appl. Bot., Genetics, and Plant Breeding*, Leningrad, xi, 2, pp. 59–66, 1928). Its natural area of dispersion is restricted to the foothills (300 to 1,000 m. high) of south-west Georgia [Transcaucasia], where it is usually grown in mixture with a wild variety of *T. monococcum*, and is known under the local name 'zanduri'. Field observations in its natural home, as well as preliminary trials in various regions of the U.S.S.R., indicated that this wheat is practically immune from black and brown rusts (*Puccinia graminis* and *P. triticina*) and only very slightly susceptible to yellow rust (*P. glumarum*), besides exhibiting high resistance to other parasitic fungi, e.g., mildew [*Erysiphe graminis*], bunt [*Tilletia caries* and *T. foetens*], loose smut [*Ustilago tritici*], and *Fusarium* spp.

While the direct introduction of this wheat into general cultivation is not recommended, owing to certain undesirable characters it possesses, it is believed that it may eventually prove to be of considerable value as a parent in breeding disease-resistant wheats, although all attempts in this direction have been so far unsuccessful, owing to the fact that the hybrids obtained were either entirely sterile or only weakly prolific. The work, however, is being continued on the lines of the triple hybrid method suggested by Kostoff in 1932.

NEWTON (MARGARET) & BROWN (A. M.). **Studies on the nature of disease resistance in cereals. I. The reactions to rust of mature and immature tissues.**—*Canadian Journ. of Res.*, xi, 5, pp. 564–581, 1 pl., 1934.

A full tabulated account is given of controlled experiments which showed that when varieties of wheat, oats, and barley resistant in the seedling stage to certain physiologic forms of stem [black] rust (*Puccinia graminis*) [*R.A.M.*, x, p. 170] were inoculated by means of a hypodermic syringe with a suspension of the uredospores of these forms [ibid., viii, p. 865] in different parts of the culm, the young, rapidly growing portions (e.g. the basal part of the peduncle and of the flag-leaf sheath) were very susceptible, whereas the older, more mature portions were highly resistant. The same was also found to be true for varieties possessing mature plant resistance. The fact that both resistant and susceptible tissues are present in the host at the same time, has little or no bearing on field resistance, as the susceptible portions of the resistant plants are generally quite effectively protected by highly resistant parts. Although large pustules of stem rust may occasionally develop above some nodes of resistant plants, the yield of the latter is not reduced in any measurable degree.

Further tests showed that the young, rapidly growing tissues are also susceptible to a number of rusts which are not natural parasites of the particular cereal concerned; for instance, under the experimental conditions *P.g. tritici* attacked oats and rye, and *P.g. avenae* and *P. triticina* attacked barley. As the susceptible parts grow older, however, they become as resistant as the remainder of the plant.

The work gave also some evidence that resistance to black rust is not due, as suggested by Helen Hart [ibid., xi, p. 562], to the failure of the germ-tubes of the rust to enter the stomata of the sheath or, as suggested

by Hursch [ibid., iii, p. 575] to the morphological structure of the hosts, but rather to some characteristic of the cells or of the protoplasm involving changes which, with advancing age, render the tissues highly resistant.

JOHNSON (T.) & JOHNSON (O.). **Studies on the nature of disease resistance in cereals. II. The relationship between sugar content and reaction to stem rust of mature and immature tissues of the Wheat plant.**—*Canadian Journ. of Res.*, xi, 5, pp. 582–588, 1934.

The results of the studies reported in this paper showed that both in the tested wheat varieties resistant in the adult stage to stem [black] rust (*Puccinia graminis tritici*) and in those which in the same stage show little or no resistance, the sugar content of the young (susceptible) tissues [see preceding abstract] is considerably higher than in the older (resistant) ones. The difference was particularly great in the content of reducing sugars but rather slight in that of the disaccharides (expressed as invert sugar). Since, however, the differences were much of the same order in all the varieties tested, irrespective of their resistance or susceptibility to rust in the adult stage, it is not believed that there exists any direct relationship between sugar content and reaction of the tissues to the rust [cf. *R.A.M.*, xiv, p. 52].

THOROLD (C. A.). **Production of an artificial epidemic of Wheat stem rust in Kenya Colony.**—*Ann. of Appl. Biol.*, xxi, 4, pp. 614–620, 1 pl., 1934.

In pointing out that in Kenya the selection of wheat varieties resistant to stem [black] rust (*Puccinia graminis tritici*) has hitherto been hampered by the fact that only one or two of the four physiologic forms of the rust so far known to occur in the colony [*R.A.M.*, xiii, p. 361] may be present naturally in a given district in any one year, the author gives a detailed account of a method which was successful in 1933 in establishing an epidemic of all the four forms at the Experimental Station at Njoro. Briefly stated, the method consists in sowing the wheat varieties and hybrids to be tested in rows surrounded by rows of varieties known to be susceptible to the four rust forms and establishing the rust epidemic on the latter, which should be sown at least ten days before the populations to be tested. Since black rust appears to develop and spread best on Marquis wheat which is susceptible to all the local forms, the method could be further improved by using this variety for the surrounding rows, in combination with other varieties differentially susceptible to each one of the four forms, for the purpose of determining whether the latter are multiplying naturally in the surrounds. The only precaution necessary is that the varieties should be quite distinct in habit when growing together in the row.

CALNICEANU (C.). **Beiträge zur Resistenzzüchtung gegen Puccinia triticina Erikss.** [Contributions to breeding for resistance to *Puccinia triticina* Erikss.]—*Kühn-Archiv*, xxxvii, pp. 57–90, 1934.

The results are fully discussed and tabulated of investigations at the Halle Agricultural Institute from 1931–3 on various aspects of the pro-

blem of physiologic specialization in brown rust of wheat (*Puccinia triticina*) in relation to the work of breeding for resistance [*R.A.M.*, xiii, p. 755].

Inoculation experiments with a combination of equal parts of two physiologic forms (13 and 15) of *P. triticina* on the susceptible Strubes Dickkopf [Squarehead] variety demonstrated that the formation of mixed pustules is possible. Simultaneous tests with a combination of the same forms on the Malakoff, Mediterranean, and Loros varieties showed that the characteristic reaction of these wheats to the individual forms is maintained in the mixed inoculation; only that component of the mixture forms pustules which ordinarily infects the given variety. Malakoff, for instance, responded only to form 13 and Mediterranean to 15; Loros, which in nature is slightly less resistant to form 15 than Malakoff, was attacked almost exclusively by 13 but developed minute necrotic pustules of 15. The same behaviour was maintained when the two physiologic forms were inoculated into the three varieties not simultaneously but at intervals of three days, and also when infection with *P. triticina* was preceded by inoculation with five German collections of *Tilletia tritici* [*T. caries*: cf. ibid., ix, p. 706; xii, p. 276].

An analysis of the physiologic forms composing the local brown rust collections obtained in 1932 showed that 14 generally predominates, in some cases together with forms 11 and 15, chiefly the former. As regards other parts of Germany and Rumania, the analytical results substantiate in a general way the conclusions reached by previous workers [ibid., xii, p. 619].

Inoculation tests on 479 European, American, and Oriental wheat varieties with forms 11, 13, 14, 15, 17, and 20 of *P. triticina* showed that the majority of the *Triticum vulgare* varieties are susceptible to all six forms. Twenty-one, however, showed resistance to some forms, e.g. Normandie, resistant to 11, 14, and 15 but susceptible to 13, 17, and 20. Only three, Ardito, Aurore, and Varonne, proved resistant to all six forms. All the varieties of *T. durum* used in the tests, e.g., Kubanka, Mindum, and Velvet Don, were more or less resistant to all six forms of *P. triticina*.

The results of inoculation tests on a number of winter and summer wheat selections, such as Peragis×Normandie, Ridit×Panzer III, and Rimpaus hybrid×Kronenweizen, indicated that resistance to *P. triticina* may be readily combined with a similar reaction to *P. glumarum* [ibid., xii, p. 208; xiii, p. 757].

MELCHERS (L. E.). **Investigations on physiologic specialization of Tilletia laevis in Kansas.**—*Phytopath.*, xxiv, 11, pp. 1203–1226, 1 fig., 1 map, 1934.

The increasingly severe outbreaks of wheat bunt (*Tilletia laevis*) [*T. foetens*] in Kansas [*R.A.M.*, xiii, p. 751] in recent years are probably due both to the appearance of more virulent strains of the fungus and to changes in the wheat varieties grown. Seven physiologic forms of the fungus have been differentiated by their types of infection on the Turkey, Martin, Hussar, White Odessa, Oro, Ridit, and Banner Berkeley varieties in four years' tests [the results of which are fully discussed and tabulated] at the Agricultural Experiment Station, Manhattan. A

dichotomous key for use in the separation of the forms is given. Form 1, characterized by the virtual absence of infection on all varieties except Kanred, was found to be the most widely distributed in the State. The varieties Turkey × Bearded and Yogo proved resistant to all the Kansas bunt collections used in the trials.

The reinoculation of *T. foetens* on resistant wheat varieties showed that small percentages of bunt in the previous season increased to a significant degree in 10 out of 32 cases. In Hussar and White Odessa the increases were so extensive (from 7·4 to 47·2 and from 1·1 to 37·9 per cent., respectively) as to suggest the development of new forms by segregation following hybridization.

Potato-sucrose (4 per cent.) and oatmeal-dextrose (3 per cent.) agar gave the best results in cultural differentiation among the physiologic forms under observation, five of which uniformly maintained their striking divergences in colour, marginal type, topography, surface growth, and consistency.

The occurrence of physiologic specialization in *T. foetens* in relation to breeding for bunt resistance in winter wheat is briefly discussed.

Hermann (S.) & Neiger (R.). **Beeinflussung der Keimfähigkeit von Weizen durch Beizung mit Salizylsäure und Salizylsäureverbindungen.** [The influence on Wheat germinability of disinfection with salicylic acid and salicylic acid compounds.]—*Beih. Bot. Centralbl.*, lii, A, 3, pp. 577–583, 1934.

In continuation of their experiments at Prague, Czecho-Slovakia, on the action of salicylic acid and some of its compounds on wheat bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, xiv, p. 90], the writers tested the effect of salicylic acid and certain salicylates on the germinability of the seed-grain.

Germinative capacity was not adversely affected by 30 minutes' immersion in solutions of magnesium, calcium, strontium, and barium salicylates at concentrations up to 0·5 per cent., the sodium and potassium salicylates being innocuous up to 2 per cent. At 0·1 per cent. acid copper salicylate did not injure germinative capacity, but at 0·25 and 0·5 per cent. some delay was noticeable and at higher strengths or under prolonged treatment the percentage of germination was reduced. Zinc salicylate caused no damage at 0·5 per cent., but at higher concentrations there was a gradual reduction of germination. Marked delay in germination followed the use of cadmium salicylate at 0·25 and 0·5 per cent., generally accompanied by injury to the root system; by the tenth day, however, the germination figures were normal.

Dusting with salicylic acid at 0·25 to 0·3 per cent. caused no ill effects, but at higher concentrations the germinative capacity rapidly declined until at 1 per cent. it was totally inhibited. Up to 1 per cent. lead and mercuric oxide salicylates were innocuous, stunting being liable to occur, however, at higher strengths. No detrimental effects on seedling germination and development were exercised by basic copper salicylate at concentrations up to 1 per cent. As already mentioned in the previous paper, 'hajkol' dust gave a definite stimulus to germination, especially at 0·25 per cent.

MAINS (E. B.). **Inheritance of resistance to powdery mildew, Erysiphe graminis tritici, in Wheat.**—*Phytopath.*, xxiv, 11, pp. 1257–1261, 1934.

Norka wheat is highly resistant to physiologic form 1 of powdery mildew of wheat (*Erysiphe graminis tritici*) in Michigan [*R.A.M.*, xii, p. 362], while susceptible to form 2. The progenies of crosses between this variety and the susceptible Webster, Ceres, Chinese, Kota, Malakoff, Reliance, and Warden segregated into plants highly susceptible to and virtually immune from form 1, the ratio of the latter to the former being 3:1. Of the 662 F_3 lines of the Norka × Chinese cross inoculated with this form, 160 proved to be uniformly resistant, 349 contained resistant and susceptible individuals, and 153 were consistently susceptible, suggesting a single genetic factor. The F_3 lines of the Norka × Reliance cross were also close to the 1:2:1 ratio. In both crosses resistance is based on a simple, dominant factor.

Norka being also highly resistant to form 3 of leaf [brown] rust (*Puccinia triticina*) [ibid., v, p. 477], the F_2 of the Norka × Ceres (susceptible) cross was simultaneously inoculated with this form of the rust and form 1 of the mildew. Of the 1,834 individuals studied for rust reaction 1,409 were resistant and 425 susceptible, resistance evidently depending on a single Mendelian factor. Of these plants 106 were susceptible to both rust and mildew, 319 susceptible to the former and resistant to the latter, 382 resistant to rust and susceptible to mildew, and 1,027 resistant to both, giving a ratio of approximately 1:3:3:9 and so agreeing closely with the expected figures for the segregation of two independent factors.

Of the 3,333 F_2 plants of a cross between Red Fern (highly resistant to both forms of mildew) and the susceptible Chinese, 2,508 were resistant and 825 susceptible, giving an approximate ratio of 3:1 and again showing resistance to be due to a simple, dominant Mendelian factor. Though Hope wheat is also resistant to form 1 of the mildew, its reaction is somewhat variable. The F_3 lines of the cross between this variety and Chinese gave 51 uniformly resistant, 122 segregating, and 55 consistently susceptible. Crossed with Marquis (susceptible), 59 of the F_3 lines were uniformly resistant, 122 segregated, and 55 were consistently susceptible. In the segregating group in both these crosses a ratio of about 1 resistant to 3 susceptible was obtained, indicating that the resistance of Hope to form 1 is governed by a single recessive factor. The same is probably the case with Sonora, in a cross between which and Chinese, 38 of the 131 F_2 plants were highly resistant and 93 very susceptible. Of the 297 F_2 plants in a cross between the highly variable Michigan Amber 29—1—1—1 and Chinese, 81 were resistant and 216 susceptible, indicating that the resistance of the former variety, which is apparently confined to the seedling stage in the greenhouse, is also inherited as a simple recessive factor.

HOFFMANN. **Bekämpfung der Fusskrankheiten des Weizens.** [Control of the foot rots of Wheat.]—*Deutsche Landw. Presse*, lxi, 46, p. 570; 47, p. 582, 1934.

There are stated to be two types of foot rot of wheat in Schleswig-Holstein, viz., blackleg (*Ophiobolus*) [*graminis*] and lodging (*Cerco-*

sporella herpotrichoides) [*R.A.M.*, xiii, p. 689; xiv, p. 157]. Of the first importance in the control of the former disorder is an absolute nutritional equilibrium, to which end an adequate foundation must be laid with lime, potash, and phosphoric acid. Nitrogen should be given in the form of well-rotted stable manure rather than in that of artificials, for the sake of creating a good store of humus and supplying the biological and physical needs of the soil. The ploughing-under of a clover-grass layer is highly effective on soils on which the crops show a tendency to foot rot. 'Mellowness' of tilth should be maintained for as long a period as possible of the entire course of vegetation. The correct adjustment of the water content of the soil is another important measure. The depth of ploughing must depend on local conditions and no hard-and-fast rules can be made concerning this factor. To sum up, any kind of soil deficiency is liable to induce blackleg foot rot.

C. herpotrichoides, on the other hand, is much more likely to flourish on an excessively rich than on a poor soil, and the measures directed against this pathogen should include the avoidance of fallow in the rotation and a judicious checking of microbiological activity in the soil.

SPRAGUE (R.) & FELLOWS (H.). **Cercosporella foot rot of winter cereals.** —*U.S. Dept. of Agric. Tech. Bull.* 428, 24 pp., 6 pl., 3 figs., 1934.

This bulletin summarizes the results up to date of investigations of the serious foot rot of winter cereals, caused by *Cercosporella herpotrichoides* in certain prairie districts (chiefly on fine sandy loam soils) of Washington, Oregon, and Idaho [*R.A.M.*, x, p. 719, and preceding abstract]. Varietal resistance tests showed that many varieties of wheat, barley, and rye are susceptible, while oats were almost immune under artificial inoculation conditions; none of the local commercially important wheat varieties was found to be resistant. Resistance in a variety is usually associated with one or several of the following characters, namely, shallow-seated open crowns, sparse tillering, short and coarse straw and tough leaf sheaths, spring habit, and very late maturity. Hohenheimer and Queen Wilhelmina (Holland) wheats are good examples of very late-maturing, resistant varieties. *C. herpotrichoides* attacks the base of the tillers in early spring, either directly through the cell walls or through the stomatal openings, and forms elliptical eye spots on the leaf sheaths. It penetrates into the inner tissues intracellularly, producing lesions in the first or second basal internode, in which internal and external stromata are formed, imparting a charred appearance to the developing culms. The lesions later shrivel, and the culms may buckle and fall under the weight of the maturing head, especially in wheat. The plants attacked are not usually severely stunted, and their roots are not invaded by the fungus.

The losses caused by *C. herpotrichoides*, the importance of which varies considerably from year to year with seasonal climatic conditions, are due chiefly to reduction in the number of culms, decrease in the size of the ears and in the weight of the grain, and increased difficulty of harvesting the fallen, irregularly ripening crop. The incidence and severity of the disease may be controlled to a certain degree by crop rotation, the use of resistant varieties, the time of sowing, and appro-

priate cultural practices. Fertilizers and chemicals were found to have little value in the control of the trouble in the field.

The bulletin also contains an account of morphological, cultural, and histological studies of *C. herpotrichoides*.

MUNDKUR (B. B.). **Some preliminary feeding experiments with scabby Barley.**—*Phytopath.*, xxiv, 11, pp. 1237–1243, 1934.

This is an expanded account of the writer's feeding experiments (with R. L. Cochran) on hogs, chickens, and guinea-pigs with scab (*Gibberella saubinetii*)-infected barley grain in Iowa [*R.A.M.*, ix, p. 369], resulting in mild pathological symptoms in the first group and in loss of weight in the others.

SCHATTENBERG (H.). **Untersuchungen über das Verhalten von Sorten, Kreuzungsnachkommenschaften und Kreuzungspopulationen gegenüber verschiedenen Herkünften von Haferflugbranden.** [Investigations on the reaction of varieties, hybrid progeny, and hybrid populations to different collections of loose smuts of Oats.]—*Kühn-Archiv*, xxxvii, pp. 409–449, 9 diags., 1934.

A very comprehensive, fully tabulated account is given of the writer's researches in 1931–2 at the Halle Agricultural Institute on the reaction of certain oat varieties, hybrid progenies, and hybrid populations to 39 German and foreign collections of loose smut (*Ustilago avenae*) [*R.A.M.*, xiii, p. 364].

On the basis of the degree of infection produced on 50,790 plants belonging to the six test varieties, Eckendorf and Lischow Early, v. Lochows Yellow, Gopher, Markton, and Black Mesdag [cf. ibid., xiii, pp. 627, 761], it was possible to subdivide the 39 collections into 12 groups ranging from highly virulent to very feebly injurious. The pathogenicity of a given collection was found to bear an absolutely specific relation only to the particular variety attacked; that is to say, a strain that is weakly injurious to the majority of the varieties may severely infect a generally highly resistant variety. Black Mesdag gave evidence of immunity from all the German and foreign collections used in these trials and may thus be regarded as qualified to act as a parent in hybridization experiments. In many cases the original degree of pathogenicity of the various collections underwent considerable modifications, in the direction both of enhanced and reduced virulence, during the course of the tests, even when they were cultivated on the highly susceptible Eckendorf Early variety. This selective action of the host can hardly be associated with aggressiveness of the pathogen [cf. ibid., xiii, p. 390], since all the collections infected this variety readily, but seems to depend on other, as yet unknown, factors.

In the work of factorial analysis 145,919 F_3 plants were utilized and nine hybrid progenies, viz., 398027 (Dippes Conqueror × v. Lochows Yellow)×Markton C.I. 2053, Carsten III×Markton, v. Lochows× Markton, Red Rustproof×Carsten III, Monarch×Dippes, Gopher× Eckendorf, v. Lochows×Eckendorf, Eckendorf×Lischow, and Dippes ×Lischow, examined for the mode of inheritance of resistance. Mono-, di-, and tri-segregation ratios were all observed [cf. ibid., xiii, p. 318], the factor for resistance being dominant.

Eight immune or resistant hybrid progenies showed, when inoculated with smut collections of varying degrees of virulence, a transgression in the direction of greater susceptibility in the F_3 families. There was no corresponding transgression towards resistance among the offspring of highly susceptible parents, and it was further impossible to isolate resistant lines by selection from susceptible progeny.

The selective action of the fungus in the infection of successive hybrid progenies was demonstrated with both strongly and feebly pathogenic smut collections in F_3 offspring and populations, comprising 11,359 plants. The results corresponded to expectations, inasmuch as the proportion of infected plants declined in successive generations; and the more virulent the smut collections used in one year the lower was the incidence of infection in the next, and vice versa.

MELCHERS (L. E.) & BRUNSON (A. M.). **Effect of chemical treatments of seed Corn on stand and yield in Kansas.**—*Journ. Amer. Soc. Agron.*, xxvi, 11, pp. 909–917, 1934.

In Kansas *Gibberella saubinetii* and *Diplodia zeae* are stated to be less common on maize than *Fusarium moniliforme* [*G. moniliformis*] and certain species of *Penicillium*, *Rhizopus*, and *Aspergillus* [cf. *R.A.M.*, xiii, p. 503]. *G. moniliformis* was detected on or in the seed of 94 per cent. of all the ears and kernels tested, but it is not an active parasite and cannot therefore be used as a criterion for the success of seed treatments. In the course of five years' experiments [the results of which are discussed and tabulated] on the effects of various commercial disinfectants on maize seed-grain, no uniformly significant advantages in yield or quality of the crops were obtained and seed treatment, therefore, cannot be recommended as a standard practice under local conditions. Of much greater importance is the selection in the field of sound, well-matured seed ears from erect stalks, followed by rapid and thorough drying.

VOORHEES (R. K.). **Sclerotial rot of Corn caused by Rhizoctonia zeae, n.sp.**—*Phytopath.*, xxiv, 11, pp. 1290–1303, 7 figs., 1934.

In 1932 the writer observed at Quincy, Florida, several decayed maize ears somewhat similar to those attacked by *Diplodia zeae* or *D. macrospora*, but differing in their sour fungoid odour and in having brown sclerotia on some of the outer husks. The affected ears are shrunken and often adhere to the husks, which are covered with a salmon-pink, later dull greyish mycelium attached to the sclerotia. In severe cases the mycelium is visible on the kernels and between the kernel rows, but sometimes only the base shows external signs of infection.

The fungus proved to be a species of *Rhizoctonia* able to infect healthy maize seedlings, especially when the mycelium and sclerotia were placed in the soil round the roots or in incisions in the stalks. Soil inoculation with pure cultures reduced seedling emergence to 31 per cent., as compared with 100 per cent. in uninoculated controls. In laboratory inoculations the roots and mesocotyl were rotted and sclerotia were formed in and on them. The highest incidence of infection on the ears of plants under field conditions was obtained by inserting the inoculum in the shank or into a wound in the ear tip. The Wheatley white dent

variety was more susceptible than Cuban yellow flint corn, especially towards maturity. The kernel is apparently penetrated by the mycelium at its base, whence it passes into the endosperm and embryo.

The fungus is stated to differ from any of the species of *Rhizoctonia* previously described and is accordingly named *R. zeae* n.sp. The sclerotia usually arise from the branching and anastomosing of hyphal aggregations and measure 0·5 to 1 mm. in diameter in culture and 0·1 to 0·5 mm. on the host, usually occurring singly but sometimes conglomerated; the hyphae are 4 to 10 μ in width, hyaline at first, reddish-brown in old cultures, and salmon-pink (later grey) on the host. Cultures maintained their viability for a year. On potato-dextrose agar the minimum, optimum, and maximum temperatures for development were 11° to 14°, 33°, and 40° to 42° C., respectively; the sclerotia resisted freezing for 15 days. The optimum hydrogen-ion concentration for growth was P_H 6·8, with a minimum near P_H 2·5 and a maximum about P_H 10·0.

VAN OVERBEEK (J.). **Die Symptome des Bormangels bei Zea mays.** [Symptoms of boron deficiency in *Zea mays*.]—*Meded. Phytopath. Lab. 'Willie Commelin Scholten'*, Baarn (Holland), xiii, pp. 29–33, 1934.

Maize plants grown in nutrient solutions without boron develop elongated, white, transparent stripes on the newly formed leaves after about a month. On transference to a solution containing boron this symptom soon disappears and normal leaves are produced. The best growth was made by plants up to four or five weeks old with 0·1 mg. of boron per l., whereas at a later period (two to three months) 1 mg. was necessary to ensure comparable development, indicating that the boron requirement increases *pari passu* with age.

HOPKINS (J. C.). **Parasitism of Rhizoctonia lamellifera, Small.**—*Nature*, cxxxiv, 3395, pp. 812–813, 1934.

The author has succeeded in obtaining 100 per cent. infection in grapefruit seedlings grown aseptically in agar media and inoculated with *Rhizoctonia lamellifera* [*R.A.M.*, xii, p. 727]. Twenty-four seedlings inoculated with an isolation of the fungus from the same host were killed in nine weeks. Inoculations with *Macrophomina phaseoli* failed.

Infection by *R. lamellifera* begins at the root tip and proceeds backwards for several inches before wilting commences. Shortly afterwards the collar, stem, and leaves are successively attacked, leading to the rapid death of the plants, in which water shortage appears to be a contributory factor. A preliminary histological examination indicates that the fungus advances along the vascular system of the young root and only penetrates the cortex to form sclerotia. This is believed to be the first authentic record of the pathogenicity of *R. lamellifera*, as opposed to other members of the *R. bataticola* group [ibid., xiv, p. 80], to living plants.

KLOTZ (L. J.) & FAWCETT (H. S.). **Valencia rind spot.**—*California Citrograph*, xx, 1, p. 4, 1 fig., 1934.

A severe breakdown of the rind of Valencia oranges was common in the summer of 1934 in southern California, especially along the coast,

following high temperatures and humidity in July. In the absence of mechanical injury the first sign of the condition was the collapse of small areas without discoloration, the process sometimes beginning with the collapse of one oil gland. The individual oil glands then turned brown or reddish, the adjoining tissues collapsed and larger areas became affected. Apparently, the rind oil escaped internally, injuring the cells adjacent to the oil glands. Where mechanical injury was present oleocellosis [*R.A.M.*, x, p. 24] sometimes preceded the breakdown. The lesions, which gradually darkened to chestnut, were usually confined to the button half, where they were most numerous on the shoulder and round the button. In the final stages they resembled one form of the water spot previously described on Navel oranges [ibid., xii, p. 690].

Susceptible Valencia oranges subjected to a fine spray of distilled water and placed in a moist chamber at 98° F. showed a similar type of breakdown after 48 hours. Further investigations are in progress.

McMartin (A.). **Locust research at Experiment Station. Experiment with Empusa grylli.**—*South African Sugar Journ.*, xviii, 11, pp. 649, 651, 1934.

Continuing his studies on the artificial cultivation of *Empusa grylli* the fungal parasite of [redwing] locusts [*Nomadacris septemfasciata*] in Natal [*R.A.M.*, xiv, p. 98], the writer observed that colonies on sterilized pieces of meat were completely overrun by bacteria in 24 hours. Grown on a medium rich in carbohydrates, on the other hand, the fungus produced the yeast-like stage previously described, bacteria being practically absent. The growth most nearly resembling that occurring on the insects in nature was obtained on sterilized potato slices; on this medium, however, the normal development was succeeded by bacterial elements which in turn were replaced by a typical *Mucor*. This phenomenon leads the author to imagine that the bacterium at a certain stage unites in some way with the *Mucor* to produce the *Empusa*. Fragments of mycelium of the *Mucor* placed on the locusts penetrate the thin parts of the skin and invade the tissues, causing death.

Ciferri (R.) & Redaelli (P.). **De la position systématique du 'Coccidioides immitis' Stiles.** [On the systematic position of *Coccidioides immitis* Stiles.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 10, pp. 373–376, 1934.

In discussing the systematic position of *Coccidioides immitis* [*R.A.M.*, xiv, pp. 100, 169] the authors, after pointing out that the main issue is whether the cells containing the so-called ascospores are asci or sporangia, adduce their reasons for regarding them as morphologically analogous to sporangia, a view which is supported by the cytological evidence. The nuclear evolution of *Coccidioides* resembles that of most of the Chytridiales. The mononucleate chlamydospores give rise by successive mitoses to the plurinucleate sporangia from which arise an indefinite but considerable number of mononucleate aplanetic zoospores; in culture these last produce plurinucleate hyphae. The cell conjugation seen in *C. immitis* [ibid., xiii, p. 635] confirms its affinity with the less highly evolved Chytridiales, e.g., *Olpidium*, while further affinities exist in the independent cellulose membrane of the sporangiospores and the

rapid disappearance from infected tissues of the mycelium, as is found also in certain parasitic Chytridiales such as *Physoderma* and *Urophlyctis*. The Coccidioidaceae and the Protomycetaceae should be regarded as parallel families deriving from the Hyphochytriaceae.

Redaelli (P.) & Ciferri (R.). **Affinité entre les agents de l'histoplasmose humaine, du farcin équin et d'une mycose spontanée des muridés.** [The affinity between the agents of human histoplasmosis, equine farcy, and a spontaneous mycosis of the Muridae.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 10, pp. 377–379, 1934.

After referring to their creation of the new family Histoplasmaceae [*R.A.M.*, xiii, p. 768], which with the Nectaromycetaceae and the Torulopsidaceae [cf. ibid., xiv, p. 192] is included in the order Adelosaccharomycetaceae containing all the asporogenous yeasts, the authors state that *Histoplasma capsulatum* [*Posadasia capsulata*: ibid., xiv, p. 100], *Cryptococcus farcinimosus* [ibid., xii, p. 172], and *C. muris* (isolated by Shortt in 1923 from rats in India) share common characteristics in their elective localization, their morphological appearance, and their manner of reproduction in human and animal tissues. They also have certain cultural and biochemical characters in common and there is, further, a certain analogy between the diseases caused by them, all of which are a form of systemic, parasitic reticulo-histiocytosis. For these reasons they transfer *C. farcinimosus* and *C. muris* to the genus *Histoplasma*, the nomenclature and synonymy of the three species of which the genus at present consists being listed.

Hansmann (G. H.) & Schenken (J. R.). **A unique infection in man caused by a new yeast-like organism, a pathogenic member of the genus Sepedonium.**—*Amer. Journ. of Path.*, x, 6, pp. 731–738, 4 pl., 1934.

Full clinical details are given of a fatal case of chronic infection, apparently localized in the skin and regional lymph nodes for some fifteen years, in a middle-aged American steel-welder. The yeast-like organisms measuring 3 to 5 μ (6 μ in the lungs), isolated from the diseased tissues, produced on a number of standard media a branching, septate mycelium, large, spiculate chlamydospores, and lateral conidia contained within the hyphae. Comparative studies were carried out with this organism and a number of others presenting a similar histological appearance; the closest resemblance was to *Histoplasma capsulatum* [*Posadasia capsulata* (Darling) Moore: see preceding abstract], but no involvement of the spleen was detected in the case under investigation. For the present the fungus is classified as a species of *Sepedonium*. It proved mildly pathogenic to guinea-pigs and rabbits and virulently so to dogs and rats, being recovered from the granulomatous lesions induced in the two latter three to four weeks after inoculation.

Sutherland-Campbell (H.) & Plunkett (O. A.). **Mucor paronychia.**—*Arch. of Dermatol.*, xxx, 5, pp. 651–658, 3 figs., 1934.

In 1929 the first-named writer reported (*Arch. of Dermatol.*, xix, p. 233, 1929) the occurrence of a species of *Mucor* in the nails of persons working with oranges in California. The fungus was shown by

inoculation experiments on oranges to cause diminution of size, loss of weight, and an initial softening followed by a gradual drying out and hardening of the fruit and a change of the orange colour to yellowish-brown, a process occupying some four months. The organism was found to be capable of existing for $4\frac{1}{2}$ years in a sealed tube without nutrients. It withstood the application of X-rays at doses up to seven skin units.

The *Mucor* isolated from oranges and from the workers' nails is considered to be a new species and named *M. paronychius*. It has two kinds of sporangiophores, tall and short, the former 8 to 11 μ in breadth, with short lateral branches, and the latter 10 to 15 μ, with branches of various types, sometimes circinate. The globose, white (later yellowish-brown) sporangia are 35 to 65 μ in diameter, the columellae being oval or rarely piriform, and measuring 25 to 40 by 18 to 28 μ; the pale grey spores are spherical, 4 to 6 μ in diameter, or oval, 5 to 7 by 3 to 4 μ. Hyaline chlamydospores may be produced within the sporangiophores, when they are either oval or oblong, somewhat blunted at the ends, 12 to 15 by 10 to 11 μ, or spherical, 11 to 13 μ; or in the vegetative mycelium, when they are oval or spherical, thick-walled, and 14 to 18 μ in diameter. Oidia are formed in liquid sugar-containing media and on the natural hosts of the fungus.

The fact that orange peel is not softened or digested is considered to show that the action of the fungus is inhibited by the volatile oils. This is not the case, however, with lemons, the inoculation of which with the *Mucor* is followed by a soft decay.

M. racemosus appears to be the only other species recorded both on man and on citrus fruits; it differs from the present organism in the dimensions, shape, and jet-black colour of its chlamydospores. The other allied species, *M. erectus*, *M. fragilis*, and *M. circinelloides* [ibid., viii, p. 335; ix, p. 426; x, p. 740; xi, p. 554] also present various features distinguishing them from *M. paronychius*.

MASON (J. H.) & BEKKER (J. G.). **Further notes on lumpy wool in South Africa.**—*Onderstepoort Journ. Veter. Sci.*, iii, 1, pp. 211–216, 1 fig., 1934.

On blood or serum agar after 24 hours' incubation at 37° C., the hyphae of *Actinomyces dermatonomus*, the agent of 'lumpy wool' among sheep in South Africa [*R.A.M.*, xi, p. 457], measure on an average 2 to 6 by 0·5 to 1 μ and often terminate in knob-like enlargements. At a later stage (48 to 72 hours) the culture consists largely of conidia, the hyphae ending in a series of coccus-like bodies, while four to six days later smears from the culture resemble those from a pure culture of a small coccus. The cultural characters and fermentation reactions of the organism are briefly described, and observations are made on its pathogenicity to laboratory animals and sheep, and on therapeutic measures. The disease is definitely associated in South Africa with a heavy rainfall.

MACY (H.) & STEELE (G. H.). **Butter as a substrate for mold growth.**—*Journ. Dairy Sci.*, xvii, 5, pp. 397–407, 1934.

In a study at St. Paul, Minnesota, on 372 mould cultures, representing 19 genera and 70 species [which are listed], besides 30 unidentified fungi,

all originally isolated from butter and the equipment used in its manufacture or packing, small blocks of sterile, unsalted butter were inoculated and stored at various temperatures to observe the effect of temperature on their growth [*R.A.M.*, xiii, p. 579].

At 22° C. over 96 per cent. of the cultures developed, *Aspergillus niger* and *Oospora lactis* [ibid., xiii, p. 511] being the chief exceptions, whereas at 5° no growth was observed after a fortnight in three species of *Aspergillus*, *Acremoniella brevis*, *Acrostalagmus cinnabarinus* [ibid., xiii, p. 769], *Monilia geophila*, *Mucor plumbeus* [ibid., x, p. 731], *Penicillium fellutatum*, and *Rhizopus speciosus*. On transference to 22°, however, most of the cultures resumed growth within a fortnight. Only two cultures gave the slightest sign of growth at — 18°, viz., *P. viridicatum* and *P. griseo-fulvum*, but here again transference to 22° was in most cases followed by renewed development.

The most serious blemishes in the appearance of the butter were caused by species of *Alternaria* (dark brown or black smudges, often involving the whole block), *Hormodendrum* (similar, sometimes dark green), *Phoma* (red, brown, green, or black), and *Stemphylium* (pink, red, or reddish-brown). The disagreeable odour imparted by the moulds was generally reminiscent of stale cheese, this effect being frequently noticeable in the absence of any visible sign of infection.

BAEZA (M.). **Recherches sur les champignons produisant des altérations dans les œufs destinés à la consommation.** [Studies of the fungi that cause tainting in eggs destined for human consumption.]—*Ann. de Parasitol. Humaine et Comp.*, xii, 6, pp. 543–550, 1 fig., 1934.

The author states that bacteriological and mycological studies of 250 eggs seized as tainted at the Central Market in Paris showed that none of them contained species of *Sporotrichum* [cf. *R.A.M.*, vii, p. 638] or *Rhinocladium*, fungi to which similar troubles have been attributed in other countries. Apart from 54 entirely rotted eggs which only yielded bacteria either alone or associated with a *Fusarium*, the fungal flora isolated from the remainder consisted of species of *Hormodendrum*, *Cladosporium*, *Alternaria*, *Stemphylium*, *Penicillium*, *Chaetomium*, *Fusarium*, *Cephalosporium*, *Tilachlidium*, *Myceliophthora*, and *Zygodesmus*, all of which reproduced the decays observed when inoculated into fresh eggs and incubated at 25° to 27° C. for four to eight days. The position of the discoloration inside the eggs, as well as the fact that none of the fungi isolated grows in pure culture at 40° C., the normal temperature of hens, are considered to indicate that infection occurs after the eggs are laid.

SCHMID (K.). **Untersuchungen an Böden und Pflanzen von erkrankten Sisalbeständen in Ostafrika.** [Investigations of the soil and plants from diseased Sisal stands in East Africa.]—*Die Phosphorsäure*, iv, 11, pp. 676–685, 2 figs., 1934.

A tabulated account is given of analyses made at the Hohenheim (Stuttgart) Agricultural College of physiologically diseased sisal (*Agave*) [*rigida* var. *sisalana*] plants and of soil samples from the affected areas of the Belgian Congo [*R.A.M.*, x, p. 383]. The soils were found to

contain the barest minimum of soluble phosphoric acid (less than 1 mg. per 100 gm. of soil), and the diseased plants contained only one-third of the phosphate content of healthy ones. The general poverty of the soils in other nutrients, e.g., potash and magnesium, is not considered to play much part in inducing the pathological condition of the sisal stands, which is attributed specifically to phosphorus deficiency.

MES (MARGARETHA G.). **A wilt of Snapdragon (Antirrhinum majus) in South Africa.**—*South African Journ. of Sci.*, xxxi, pp. 281–287, 4 figs., 1934.

Snapdragons (*Antirrhinum majus*) in the Pretoria district and other parts of South Africa are stated to be liable to a sudden wilt involving the root system and stem base. Most of the young roots are more or less completely rotted, while the cortex of the older ones often falls away, exposing the discoloured xylem tissues. The stem base is discoloured on one side or all round, the dark, water-soaked, slightly sunken area, of a tough consistency, sometimes extending as high as the lower lateral branches.

The diseased cortical and xylem tissues contained a mycelium and numerous oogonia of a *Phytophthora*, and on placing fragments of the material in water papillate sporangia, sometimes with zoospores, developed in profusion. In almost every case of severe decay a *Fusarium* was also isolated but in the incipient stages of the disease a pure culture of the *Phytophthora* was consistently obtained. The results of inoculation experiments [details of which are given] with each of these organisms separately and together showed conclusively that the *Phytophthora* is the agent of the wilt, the *Fusarium* being purely secondary; its only additional effect appears to be the production of a purple to reddish discoloration often noticed in the diseased tissues. The *Phytophthora* survived throughout the summer (October 1933 to April 1934) in completely air-dry soil in the open.

The fungus grew readily on various media, forming sporangia and oogonia after about eight days. The ovate or piriform, papillate sporangia measure 26 to 88 by 18 to 37 μ, with varying averages in different cultures of 42 by 25 μ, 45 by 27 μ, and 49 by 33 μ. Germination frequently occurs by one or more apical or occasionally basal germ-tubes; in other cases at least 30 slightly piriform zoospores, measuring about 10 μ, were liberated from each sporangium. The smooth, spherical to subspherical oogonia, usually having a broad, funnel-shaped base, measure 18 to 28 μ with an average of 23 μ. The oospores are thick-walled (2 to 3 μ), yellowish to yellow-brown, and the antheridia nearly always paragynous. In these particulars the fungus corresponds fairly closely with *P. pini* var. *antirrhini*, the agent of a foot rot and wilt of *A. majus* in India [ibid., viii, p. 243], which is included by Tucker under *P. cactorum* [ibid., x, p. 755]. The South African organism is therefore referred to *P. cactorum* [ibid., xiii, p. 784], also reported as the cause of a similar snapdragon disease in California [ibid., xiii, p. 581].

From the temperature relations of *P. cactorum* the wilt might be expected to reach a climax in hot weather, and such is in fact the case in the Pretoria district, where the most severe outbreaks occur in

November. The addition of naphthalene to the soil was found by one grower to prevent the occurrence of the wilt, and control experiments along this line are in progress.

CHITTENDEN (F. J.). **Antirrhinum rust: a plea.**—*Journ. Roy. Hort. Soc.*, lix, 5, pp. 450–451, 1934.

After briefly recapitulating the facts relating to the sudden outbreak of snapdragon (*Antirrhinum majus*) rust [*Puccinia antirrhini*], previously known only in the United States and Bermuda, in England in 1933 [*R.A.M.*, xiii, p. 771], the writer advances an urgent plea for the eradication of all snapdragon plants, even those in apparent health, during the month of November. Only by such measures will it be possible to save this very popular flower (some 7,000,000,000 seeds of which are sown annually in England) from further destruction. Infection has spread so rapidly that no part of the country can now be regarded as free, and there is little hope, at any rate for many years to come, of developing immune varieties. The results of spraying experiments have so far been disappointing, their success, according to American reports, being apparently due to certain favourable weather conditions of rare occurrence in this country.

[This paper also appears in *Gard. Chron.*, xcvi, 2499, p. 359, 1934.]

LAUBERT (R.). **Der Löwenmaulrost, ein Musterbeispiel sich rasch ausbreitender eingeschleppter Pflanzenkrankheiten.** [The Snapdragon rust, a model example of rapidly spreading imported plant diseases.]—*Die Kranke Pflanze*, xi, 11, pp. 142–143, 1934.

The latest addition to the growing number of plant diseases introduced into Germany (and in some cases into Europe) since 1900 [*R.A.M.*, xii, 578] is the snapdragon rust [*Puccinia antirrhini*: ibid., xiv, p. 172], reported (according to Dr. Poeverlein) from northern France in 1931 and from England in 1933 [see preceding abstract]. In July 1934 the rust was observed near Cologne and subsequently in a destructive form in the Mülheim and Essen districts (Rhine) [see next abstract]. The symptoms of the disease are briefly described and control measures indicated.

SOMMER (H.). **Antirrhinum-Rost jetzt auch in Deutschland.** [*Antirrhinum* rust now also in Germany.]—*Blumen- und Pflanzenbau verein. mit Gartenwelt*, xxxviii, 44, p. 558, 1 fig., 1934.

Antirrhinum [*majus*] plants in the Darmstadt district of Germany were destructively attacked by *Puccinia antirrhini* [see preceding abstract] in August 1934, all being dead right down to the roots by the middle of September.

BUCHWALD (N. F.). **Løvemundrust (Puccinia antirrhini). En ny Svampesygdom i Danmark.** [Snapdragon rust (*Puccinia antirrhini*). A new fungous disease in Denmark.]—*Gartnertid.*, l, pp. 656–657, 1934.

A popular note is given on snapdragon rust (*Puccinia antirrhini*) [see preceding abstracts], the occurrence of which in a private garden at

Vanløse constitutes a new record for Denmark. Control measures are briefly indicated.

HOWARD (F. L.). **Felicia amelloides Voss, an unreported host for Erysiphe cichoracearum DC.**—*Phytopath.*, xxiv, 11, p. 1315, 1934.

The popular blue *Agathaea* daisy (*Felicia amelloides* Voss) [*Aster rotundifolius* Thunb.] has been found to suffer fairly severe damage from powdery mildew (*Erysiphe cichoracearum*), apparently not hitherto recorded on this host, in Rhode Island. The white mycelium and conidiophores are associated with scattered patches of dark reddish-brown perithecia, each containing eight or more stipitate asci usually with two ascospores. The haustoria are simple. The infected foliage shrivelled, died prematurely, and fell.

VAN LUIJK (A.). **Untersuchungen über Krankheiten der Gräser.** [Investigations on grass diseases.]—*Meded. Phytopath. Lab. 'Willie Commelin Scholten'*, Baarn (Holland), xiii, pp. 1–22, 2 pl., 1934.

The pathological conditions of lawns and golf greens known in the United States as 'large brown patch' and 'small brown patch' are stated to be prevalent also in Holland [*R.A.M.*, xiv, p. 12]. Of the various parasitic fungi isolated from the affected turf (mostly *Festuca duriuscula* and *Agrostis stolonifera*) the following were the most frequent: *Pythium irregulare, P. de Baryanum, P. mamillatum* [ibid., x, p. 487], *P. torulosum* Coker & Patterson (some details of the morphology of which are given), *P. volutum* Vanterpool & Truscott, *Rhizoctonia* [*Corticium*] *solani*, and species of *Sclerotium, Helminthosporium*, and *Fusarium*. The two last and a virulent form of *C. solani* were also isolated from grass seeds.

From the results [which are fully described and tabulated] of inoculation experiments under controlled conditions with a number of the above-mentioned organisms, it is apparent that all the species of *Pythium* except *P. torulosum* (which rather exerted a stimulatory effect) are more or less virulent parasites of the grasses under observation and also of *Lolium annuum* var. *westerwoldicum*, in their younger stages. The pathogenicity of *C. solani* was more pronounced at greenhouse temperatures (24° to 32° C.) than at room temperature, but the reverse was the case with the species of *Sclerotium* isolated.

In a series of inoculation experiments with the grass parasites on sterilized seed, germination was slower in the treated material in sterile soil; under certain conditions, however, not yet fully understood, the presence of saprophytic fungi in unsterilized soil seems to stimulate the growth both of plants and pathogens.

TOMSON (R.). **Ristikuvähk ja teised Ristiku haigused Eestis.** [Stem rot and other diseases of Clovers in Esthonia.]—Reprinted from *'Agronoomia'*, Tartu [Dorpat], *1934*, 8–9, 24 pp., 10 figs., 1934. [German summary.]

In this paper an account is given of the chief fungal diseases that have been described on clovers [*R.A.M.*, ix, p. 787], among which the following are stated to have been recorded in Esthonia: stem rot

(*Sclerotinia trifoliorum*), anthracnose (*Gloeosporium caulivorum*) [*Kabatiella caulivora*], *Uromyces trifolii-repentis* [ibid., viii, p. 604], *U. minor* [ibid., vi, p. 684], *Peronospora trifoliorum*, *P. trifolii hybridi* Gäum., *Phyllachora* [*Dothidella*] *trifolii* [ibid., ii, p. 546; iv, p. 96], *Pseudopeziza trifolii* [ibid., i, p. 422], and *Erysiphe martii* [*E. polygoni*: ibid., xii, p. 615].

Buchholtz (W. F.). **The rôle of damping-off diseases in relation to failures of Alfalfa stands on some acid soils.**—*Science*, N.S., lxxx, 2083, p. 503, 1934.

A fungus, believed to be a species of *Pythium* [cf. *R.A.M.*, iv, p. 654], was isolated in 1933 from the collapsed tissues of lucerne seedlings growing on acid soils in Iowa, the damping-off percentages on three types of which were 41, 48, and 16, respectively, compared with only 7 and 6, respectively, on two neutral soils. In the germination and emergence stages the invasion of the seedlings is so rapid that complete collapse and general necrosis take place within 24 hours, while local lesions may be produced on the hypocotyls and primary roots at any time until the plants are fully established. The organism was inoculated into lucerne seedlings grown in sterile soil with positive results. A higher percentage of healthy seedlings developed in acid soil steamed for two hours at 15 lb. or disinfected with 0·5 per cent. formaldehyde than in untreated soil, while some evidence was forthcoming that damping-off may be combated in acid soil by limestone and hydrated lime. Less infection occurred on seedlings in pots of acid soil at 9° than at 20° to 25° C.

Rudloff (C. F.) & Schmidt (M.). **Venturia inaequalis (Cooke) Aderh. II. Zur Züchtung schorfwiderstandsfähiger Apfelsorten.** [*Venturia inaequalis* (Cooke) Aderh. II. On the breeding of scab-resistant Apple varieties.]—*Der Züchter*, vi, 11–12, pp. 288–294, 3 figs., 1 diag., 1934.

Experiments are in progress at the Kaiser Wilhelm Plant Breeding Institute, Müncheberg, Mark Brandenburg, to develop apple varieties combining desirable commercial qualities (especially as regards size and flavour of the fruit) with resistance to scab (*Venturia inaequalis*), the annual losses from which in German orchards are estimated at M.40,000,000 to 60,000,000. The fact that none of the standard apple varieties possesses any conspicuous degree of resistance led to observations in 1933–4 on ten species of *Malus* [*Pyrus*: cf. *R.A.M.*, xiii, p. 383], among which *P. atropurpurea* and *P. micromalus* remained free from infection in both years, while *P. spectabilis* and *P. zumi* were only mildly attacked in 1933 and showed no sign of disease in 1934. On the other hand, *P. baccata* proved highly susceptible and *P. scheideckeri* also suffered severely in both years. In a series of controlled tests, using a method of intensive inoculation [details of which are given] with conidial suspensions of the fungus, 20 out of 22 cultivated apple varieties developed scab, the exceptions being Antonowka and Ernst Bosch, as also did *P. hislop* and *P. prunifolia*, while *P. arnoldiana* remained healthy. The incubation period ranged from 13 to 29 days. In a further extensive series of inoculation experiments in 1934 on seedlings of species, varieties, interspecific, and intervarietal crosses,

promising results were obtained, e.g., in crosses between Ernst Bosch and (1) *P. baccata* var. *himalaica* and (2) *P. niedzwetzkyana* (62·3 and 43·6 per cent., respectively, of the seedlings free from infection). The segregation of types with larger fruits than the wild parent was observed in the F_1 progeny of a cross between *P. zumi* and Yellow Bellefleur, and altogether there is considered to be every hope that this line of research may be profitably pursued.

The data obtained in these investigations do not warrant the conclusion that the extreme morphological divergences in monospore cultures of *V. inaequalis* from different apple varieties are accompanied by any strict degree of physiologic specialization [ibid., x, p. 464].

Kent (W. G.). **A commercial Apple-spraying demonstration in 1933.**—*Journ. Min. Agric.*, xli, 8, pp. 733–742, 1934.

The spraying experiments in 1933 in the same apple orchard as in 1932 [*R.A.M.*, xiii, p. 105] gave, in the plots that were sprayed four times (10th and 18th April, 10th and 22nd May) with Bordeaux mixture of the same composition as in the previous year, an increase in the percentage of apples free from scab [*Venturia inaequalis*] ranging from 76·7 to 77·5 (92·8 and 90·6 per cent. clean apples as compared with 16·1 and 13·1 per cent. in the controls), while in the plots sprayed with lime-sulphur (1·2 in 40 galls., subsequently diluted to 1 in 80 and 1 in 100, lead arsenate being added only to the first spray) the percentage of clean apples was increased by from 60·8 to 64. The total cost of the sprayings (£13 17*s.* 7*d.*) worked out at £2 8*s.* 10*d.* per acre, as against £3 4*s.* 7*d.* in 1932, the reduction being due chiefly to the omission of the spreader with lime-sulphur and of the lead arsenate in the second spray, and also to the fact that in 1933 the labour cost 2*s.* 0½*d.* per 100 galls. as against 3*s.* 0¼*d.* in 1932. In 1933 all the sprayings were made through large-capacity nozzles, whereas in the previous year the nozzles for the first spraying were of small capacity and were progressively increased subsequently.

Mitra (A.). **Apple rot caused by Fusarium moniliforme Sheldon.**—*Current Science*, iii, 5, pp. 202–203, 1 fig., 1934.

When pure cultures of *Fusarium moniliforme* [*Gibberella moniliformis*] occurring as a saprophyte in India were inoculated into apples which were then kept for 35 days at 19·5° to 22·8° C. a rot resulted which destroyed 22 per cent. of the flesh in the period. This is thought to be the first record of *G. moniliformis* as parasitic on apples. Negative results were given by inoculations with *F. camptoceras*, *F. semitectum*, *F. semitectum* var. *majus*, and *F. diversisporum*.

Carne (W. M.) & Martin (D.). **Apple investigations in Tasmania: miscellaneous notes.**—*Journ. Australian Council Sci. & Indus. Res.*, vii, 4, pp. 203–214, 1934.

After discussing the theory recently propounded by Atanasoff that bitter pit of apples, including the various manifestations termed drought spot, cork, crinkle, &c., is a virus disease [*R.A.M.*, xiii, p. 707] and adducing reasons which lead them to regard it as untenable, the authors state that crinkle is one of several non-parasitic disorders of apples collectively known as cork, and that water-core [ibid., x, p. 115]

is an essential prerequisite to it. Experience in Western Australia and Tasmania has shown that in the more susceptible apple varieties visible crinkle generally occurs 10 to 14 days after a heat wave in January or February, heat and drought being conditions known to conduce to the development of water-core. The first stage in the production of crinkle from water-core involving most of the flesh is the browning of the injected tissues close to the skin. This area then dies and dries out. Cavities form in the dead tissue and the overlying surface of the apple collapses in an inward direction.

Emphasis is laid on the association of water-core with breakdown which has been observed by the writers in fruit on the tree as well as in cool storage and on the market. The three main types of water-core breakdown observed in Australia and Tasmania as well as in Australian apples in London are described. These are (1) radial (also known as inherent breakdown), (2) breakdown of the deep scald type, and (3) early water-core type found particularly in the French Crab variety in Tasmania in 1934.

PLAGGE (H. H.). **The storage behaviour of Apples as influenced by nitrogen fertilization and storage temperature.**—*Iowa State Coll. Journ. of Sci.*, ix, 1, pp. 95–114, 4 graphs, 1934.

This is a summarized account of investigations from 1929 to 1931, inclusive, carried out on Grimes and Jonathan apples in Iowa to determine the possible existence of a causal relationship between the nitrogen content of the fruit, as influenced by nitrogen fertilization of the trees, and susceptibility to soggy [low temperature] breakdown [*R.A.M.*, xiv, p. 41]. The [tabulated] results indicated that in 1929, when the growing season was about normally wet, susceptibility to the breakdown was apparently increased by applications of sodium nitrate, while in the two following years, which were dry, little breakdown occurred and no significant differences were noted in the susceptibility of the fruit from the various plots. Nitrogen content (especially in the non-colloidal form) was apparently increased in the apples from trees that had received applications of nitrate fertilizer the same year or the preceding one, but not in the third year after application. Susceptibility to soggy breakdown, however, was not apparently increased by increase in the total nitrogen content of the apples. In general, but not always consistently, the sodium nitrate applications slightly reduced the total sugar content of the fruit, but the results of storage tests indicated that sugar content at the time of storage cannot be used as a criterion of susceptibility to breakdown. The most marked changes during storage, especially at the higher temperatures (48° to 50° F.), were in sucrose content, which reached a very low level in some apples from the nitrated trees; the ratios of sucrose to total nitrogen or to either the non-colloidal or colloidal nitrogen fractions determined on the date of picking did not appear to be correlated with susceptibility to the breakdown. On the other hand the ratio of reducing sugar (which was found to be more stable during storage) to non-colloidal nitrogen content was consistently higher in fruit of both varieties from the untreated than from the nitrated plots throughout the three years of the experiments,

and this is possibly one explanation for the greater resistance to breakdown of the apples from the control trees. Another is the fact that fruit from the latter consistently gave a higher yield in alcohol-insoluble residue after complete starch hydrolysis during storage, suggesting that such fruit differentiates more cell walls than the apples from nitrated trees.

McCallan (S. E. A.) & Wilcoxon (F.). **Fungicidal action and the periodic system of the elements.**—*Contrib. Boyce Thompson Inst.*, vi, 4, pp. 479–500, 1 fig., 1 graph, 5 diags., 1934.

This is a briefly annotated report of the results obtained by the authors in their investigation of the toxicity to the conidia of *Sclerotinia americana*, *Botrytis paeoniae*, *Pestalotia* [*Pestalozzia*] *stellata*, and the uredospores of *Uromyces caryophyllinus* of compounds of a large number of elements in relationship to the position of the latter in the periodic system, the measure of toxicity used being the concentration of the toxic agent permitting the germination of 50 per cent. of the spores (LD (lethal dose) 50). In general, it was found that within a group of elements the toxicity increased with the atomic weight, and also tended to increase towards the centre of the periodic table of the elements in that group and to decrease towards both ends of it. Compounds of the more positive elements exhibited practically the same toxicity, independently of the particular compound tested, but in the case of the more negative elements, toxicity varied widely with the particular type of compound used. All the volatile hydrides tried were highly toxic, while the most highly oxidized forms showed little or no toxicity. A marked tendency was observed for a given element toxic to one fungus to be also toxic to the others, but this correlation was by no means general. Compounds of osmium and silver were the most toxic, and a number of elements were found to have compounds of higher toxicity than those of copper. The investigation showed that, in addition to mercury and copper, the elements which may find wider application as fungicides are cerium, cadmium, lead, thallium, chromium, and arsenic.

Rolet (A.). **Le sulfate de cuivre qui tombe sur le sol des vignobles.** [The copper sulphate that falls on vineyard soils.]—*La Vie Agric. et Rurale*, xxiii, 46, pp. 345–346, 1934.

It has been estimated that the 6,000 hect. of vineyard soil in the canton of Vaud, Switzerland, absorbed during the period from 1886 to 1906 some 1,560,000 kg. of metallic copper from the treatment of the vines against [downy] mildew [*Plasmopara viticola*] with Bordeaux mixture. Investigations at the Saône-et-Loire (France) Agricultural Station have shown that the process of nitrification is not sensibly impeded by the accumulation of copper sulphate, presumably on account of the insoluble form assumed by the salts on contact with the carbonate of lime, ferric oxide, and aluminium in the soil. For the most part, moreover, the copper in alkaline mixtures is already insoluble on reaching the soil, so that no detrimental effects from its liberal application as a fungicide need be feared.

BORDAS (J.). **Action de l'urée sur les suspensions colloïdales.** [The action of urea on colloidal suspensions.]—*Comptes rendus Acad. d'Agric. de France*, xx, 23, pp. 777–780, 1934.

A valuable enhancement of the stability of fungicidal colloidal suspensions of copper or sulphur, with or without resin (50 gm. in $\frac{1}{4}$l. denatured alcohol per 100 l.), was obtained by the addition of some 2 l. per 100 l. of a 20 per cent. solution of pure urea.

NAOUMOFF (N. A.). Болезни садовых и овощных растений с основами общей фитопатологии. [Diseases of orchard and kitchen-garden plants, with the elements of general phytopathology.]—2nd. ed., 344 pp., 83 figs., 2 graphs, 7 maps, Госуд. Издат. Колхозной и Совхозной Литер. ,,Сельхозгиз" [State Publishing Office 'Selkhozgiz'], Moscow, 1934.

The author prefaces this book with the statement that it is compiled on much the same lines as the first edition [*R.A.M.*, xi, p. 255], with additions to bring it up to date, especially as regards the control of the diseases dealt with. The sixteen pages of bibliography appended give references almost exclusively to works published during recent years, not included in the first edition.

BLACKBURN (KATHLEEN B.). **Wasting disease of Zostera marina.**—*Nature*, cxxxiv, 3393, p. 738, 1 fig., 1934.

The author's studies of the chromosomes of the narrow-leaved form of *Zostera* which has in certain localities replaced *Z. marina* destroyed by the wasting disease [*R.A.M.*, xiv, p. 50] lend little or no support to the view that this form is a hybrid between *Z. marina* and *Z. nana*. The chromosomes of the narrow-leaved form (*Z. marina* var. *angustifolia*) agree with those of *Z. marina*, of which it is suggested it may be an ecological form.

CHESTER (K. S.). **Specific quantitative neutralization of the viruses of Tobacco mosaic, Tobacco ring spot, and Cucumber mosaic by immune sera.**—*Phytopath.*, xxiv, 11, pp. 1180–1202, 10 figs., 1934.

By means of a specially evolved technique [full details of which are given] the writer investigated the capacity of the viruses of tobacco mosaic and ring spot and cucumber mosaic [*R.A.M.*, xiv, p. 5] to induce in rabbits the production of neutralizing antibodies [cf. ibid., xiv, p. 197].

Normal rabbit serum was found to inhibit virus infectivity through decreasing the susceptibility of the host plants (Early Golden Cluster beans [*Phaseolus vulgaris*] and occasionally *Nicotiana glutinosa* for tobacco mosaic and Black Eye cowpeas for ring spot and cucumber mosaic) and not through an effect on the virus. This property is shared by other non-specific proteinaceous substances, such as healthy tobacco extract, ovalbumin, and milk. Virus-immune serum, in addition to producing the same non-specific effect on the host as normal serum, further exerts a specific neutralizing action on the virus used in immunization. The host-inhibitory effect of normal serum, however, is independent of time *in vitro*, whereas the process of virus neutralization by immune serum requires a certain incubation period of the serum-virus mixture to become effective; it is probably accomplished to a great extent in 10 to 15 minutes at room temperature.

Neutralization of the tobacco mosaic virus follows a law of multiple proportions: if the amount of virus be increased by a given percentage, the quantity of immune serum added must be increased by the same percentage in order to produce a comparable inhibitory effect. An absolute cross-specificity was demonstrated in the neutralization of the three viruses tested, each of which is completely neutralized exclusively by its homologous serum, while the other two sera behave just as normal serum.

These experimental results are considered to show that the reaction is a specific, quantitative neutralization of virus by immune serum, a phenomenon not hitherto reported in connexion with plant viruses.

In preliminary experiments on strains of the viruses under consideration it was found that the yellow and green strains of cucumber mosaic are closely related serologically, while the former is wholly unrelated to a superficially indistinguishable yellow strain of tobacco mosaic.

Smith (K. M.) & Dufrénoy (J.). **Sur le virus Y des Solanées.** [On the Y virus of the Solanaceae.]—*Comptes rendus Acad. des Sciences*, cxcix, 21, pp. 1147–1150, 2 figs., 1934.

The first-named writer has previously shown that the severe symptom complex known as 'crinkle' ('frisolée') is induced in potatoes by the interaction of the X and Y viruses [*R.A.M.*, xi, p. 394; cf. also xiv, p. 185]. Aphids (*Myzus persicae*) fed on a Solanaceous plant infected by these two viruses acquire the capacity to transmit Y independently of X to other members of the same family, especially tobacco.

On certain potato and tobacco varieties the Y virus produced necrotic or dark green bands, respectively, along the leaf veins, manifestations giving rise to the American name of 'veinbanding'. The thickened, dark green bands on tobacco leaves are composed of abnormally elongated palisade cells while the cells of the spongy parenchyma are more numerous and closer together than in healthy areas. The chloroplasts are relatively well supplied with starch but deficient in fat. The chloroplasts of affected leaves, detached from the stems and allowed to wither gradually, preserve their green colour, instead of turning yellow during the process of fatty degeneration as in normal tissues. As in the case of infection by the so-called 'tobacco' viruses, the mitochondria in tobacco leaves invaded by the Y virus show a tendency to a 'honeycomb' arrangement in files along the cytoplasmic trabeculae round small vacuolar agglomerations. This cytoplasmic network stains vividly and many of the cells are found to contain striate inclusions apparently consisting of bundles of tyrosine crystals.

These cytological data may be interpreted as indicating that the Y infective principle, like other members of the virus group, tends to retard the synthesis of the cytoplasmic complexes and thereby to induce the accumulation of amino-acids.

Storey (H. H.). **The photodynamic action of methylene blue on the virus of a plant disease.**—*Ann. of Appl. Biol.*, xxi, 4, pp. 588–589, 1934.

The results of the author's experiments very briefly described in this note are interpreted to indicate that the virus of maize streak [*R.A.M.*,

xiv, p. 146] is inactivated by adding to it sufficient methylene blue ('medicinale' of Meister Lucius and Brüning) and then irradiating the mixture for 3 to $4\frac{1}{2}$ hours in diffused daylight at an open window [ibid., xiv, p. 186]. The virus agent was not inactivated, on the other hand, when the virus plus methylene blue mixture prepared in a dark room was kept for a similar period in total darkness, or when the virus fluid alone was irradiated as in the first series. These results are correlated with recent work by Perdrau and Todd [loc. cit.] on animal viruses as well as on certain races of bacteriophage.

JAHN (E.). **Die peritrophe Mykorrhiza.** [Peritrophic mycorrhiza.]—*Ber. Deutsch. Bot. Gesellsch.*, lii, 8, pp. 463–474, 3 graphs, 1934.

As a result of his investigations at Hann.-Münden, the author distinguishes three types of mycorrhiza, endo-, ecto-, and peritrophic, the latter including not only external fungi having a more or less close relationship with the root, but also accompanying saprophytes that merely occupy the space around the root and between it and the soil (the rhizosphere). These peritrophic mycorrhizal fungi do not penetrate the root but the author considers that they have a symbiotic function. Thus, in Freisleben's recent experiments with *Vaccinium* spp., growth was stimulated, not only by the addition to the cultures of the associated endophyte, but also by that of any one of several common soil moulds [*R.A.M.*, xiii, p. 794]. The provision of a zone of high acidity appears to be the physiological province of the peritrophic mycorrhizal fungi, which consist largely of Mucorineae and *Penicillium* spp. Some of these organisms, e.g., certain strains of *Mucor racemosus* and *M. ramannianus* [ibid., xii, p. 191; xiii, p. 484, *et passim*], appear in fact to be confined to the peritrophic layer of the rhizosphere. *Polyporus* [*Fomes*] *annosus* [ibid., xiii, p. 738] is known to occur in a particularly destructive manner on trees in former arable soil, its marked capacity for acidification presumably enabling it to join the other peritrophic occupants of the rhizosphere and thus to reach and penetrate the root tissues.

MOLLIARD (M.). **Bruyères et mycorhizes.** [Heaths and mycorrhiza.]—*Comptes rendus Acad. des Sciences*, cxcix, 19, pp. 900–902, 1934.

Sterilized *Calluna vulgaris* seeds sown in sterilized heath soil in tubes germinated equally well with those in unsterilized soil but the resultant seedlings in the former lot made poor growth and turned red whereas those of the latter series developed quite normally. It would have been natural to conclude that the presence of endophytes in the unsterilized series stimulated the growth of the plants [cf. preceding abstract], but these organisms could not be detected with certainty in the radicles and a different explanation had therefore to be sought. Soil sterilized at 120° C. undergoes, in the presence of a certain amount of water, physical and possibly also chemical alterations, becoming very compact and tending to coagulate in such a way as to offer little chance of penetration by the fine radicles of *C. vulgaris*. An attempt was therefore made to develop a culture medium partaking as nearly as possible of the chemical nature of heath soil and having a physical structure suitable for *Calluna* growth. To this end tubes were filled with the filtered product of a two to three days' suspension of heath soil in an equal

quantity of distilled water, a portion of the inner tube wall being covered with a thick layer of hydrophilic cotton-wool. After one hour's sterilization at 120° the seeds were sown on the cotton at different levels in relation to the water in the bottom of the tube. Germination was particularly profuse in the absence of any mineral or organic admixture, and the development of the seedlings was the more satisfactory the closer they were to the liquid reserve in the lower part of the tube. At a distance from the water the above-mentioned arrest of growth and reddish coloration were evident, whereas the plants receiving a sufficient moisture supply assumed a perfectly natural aspect, producing an abundance of bright green foliage and attaining a height of 6 to 8 cm. during the period from January to October.

It is apparent from these results that *C. vulgaris* can develop normally on cotton soaked in sterilized heath water as described above, so that any intervention in its growth by the micro-organisms occurring in natural heath soil must be of an indirect order (possibly creating a favourable nutritional environment) rather than in the nature of an intimate obligatory association.

VAN DER PIJL (L.). **Die Mycorrhiza von Burmannia und Epirrhizanthes und die Fortpflanzung ihres Endophyten.** [The mycorrhiza of *Burmannia* and *Epirrhizanthes* and the reproduction of their endophyte.]—*Rec. Trav. Bot. Néerlandais*, xxxi, 3–4, pp. 761–779, 14 figs., 1934.

A description is given of the Phycomycetoid mycorrhizal fungus [*R.A.M.*, xii, p. 309] occurring in the roots of the Javanese saprophytic plants, *Burmannia candida* and *Epirrhizanthes elongata*. In both cases the endophyte is provided with typical globular, piriform, or irregular vesicles, 30 to 60 μ in diameter, but no arbuscles (sporangioles) were observed, these being replaced by coils of hyphae somewhat resembling those formed in the Orchidaceae, though less dense.

Some of the vesicles, which are not cut off by a septum from the parent hypha, develop into *Synchytrium*-like sporangia containing up to 1,000 spores, the further fate of which was not followed. Others are believed to be oogonia, and a fertilization is suggested by cases in which two nuclei in contact remain in the centre of the vesicle while the others collect at the periphery, as in certain Phycomycetes. This assumed fertilization, however, was not actually observed and neither antheridia nor oospores were found.

Though the chitinous wall of the vesicle suggests relationships with other groups (Zygomycetes), the general characters of the mycorrhizal fungus of *B. candida* and *E. elongata* are considered to place it in the Oomycetes near the Peronosporaceae.

WEINDLING (R.). **Studies on a lethal principle effective in the parasitic action of Trichoderma lignorum on Rhizoctonia solani and other soil fungi.**—*Phytopath.*, xxiv, 11, pp. 1153–1179, 1 fig., 5 graphs, 1934.

Some of the aspects of the writer's studies on the lethal principle on which the pathogenicity of pigmented cultures of *Trichoderma lignorum* to the citrus strain of *Rhizoctonia* [*Corticium*] *solani* and other soil fungi depends have already been summarized [*R.A.M.*, xiv, p. 188].

Uniform methods have been devised for the extraction and evaluation of the lethal principle. The lethal effects of various toxic solutions are compared by means of the so-called 'lethal index', represented by the reciprocal of the minimum concentration at which the hyphae of *C. solani* are killed. The approximate production curve of the lethal principle during the life-cycle of *T. lignorum* indicates that it is excreted into the surrounding medium by young hyphae only, the maximum amount being developed two days after spore germination, at which time also the parasitic action of the fungus on the soil organisms reaches a climax. The toxicity of the filtrate is greatly reduced by adsorption on substances such as animal charcoal and the toxic agent is rapidly decomposed at room temperature. It is greatly weakened by boiling but not entirely destroyed even by prolonged autoclaving. The lethal effects of the agent were found to decline with an increase in the hydrogen-ion concentration of the medium which induces rapid deterioration under aerobic conditions.

T. lignorum has further been shown to be capable of parasitizing *R. bataticola* [*Macrophomina phaseoli*] and *Armillaria mellea*.

SCHULTZ (H.). **Über das Auftreten der echten Mehltaupilze.** [On the occurrence of the true mildew fungi.]—*Blumen- und Pflanzenbau verein. mit Gartenwelt*, xxxviii, 44, pp. 553–554, 1934.

While in general, fungous diseases of horticultural plants were conspicuous by their absence during the prolonged summer drought of 1934 in Germany, the powdery mildews [Erysiphaceae] formed an exception. Popular notes are given on the characters and control of some of these diseases.

HARRISON (J. W.). **Thermogenesis in hay-inhabiting fungi.**—*Iowa State Coll. Journ. of Sci.*, ix, 1, pp. 37–60, 1 fig., 14 graphs, 1934.

Details are given of cultural experiments with 14 common hay-inhabiting fungi in the State of Iowa, the results of which showed that the optimum temperatures for growth of the different organisms were 15° to 20° C. for *Hormodendrum nigrescens* and *Penicillium humicola*; 25° for *Rhizopus nigricans*, *P. oxalicum*, and *Alternaria humicola*; 30° to 35° for *Aspergillus flavus*, *A. terreus*, *A. clavatus*, *A. niger*, *R. tritici*, *Mucor abundans*, *Spicaria divaricata*, and *Cunninghamella elegans*; and 40° for *A. fumigatus*. All the fungi tested were shown to be more or less thermogenic when incubated on sterile lucerne hay, with the exception of *A. fumigatus*, *A. clavatus*, *P. humicola*, *S. divaricata*, and *Alternaria humicola*, which developed little or no heat under the conditions of the experiments. Periods of rapid accumulation of heat coincided with periods of active germination and growth of the same organisms in culture. Carbon dioxide production was not a measure of thermogenesis.

DAS GUPTA (S. N.). **Studies in the genera Cytosporina, Phomopsis, and Diaporthe. VI. On the conversion of one strain of Diaporthe perniciosa into another.**—*Phil. Trans. Roy. Soc. London*, Ser. B, ccxxiii, pp. 121–161, 4 pl., 10 figs., 5 graphs, 1934.

A detailed study [the results of which are tabulated] of the relationship between the strains DH_0 and DH_F of *Diaporthe perniciosa* [*R.A.M.*, ix, p. 50] showed that on the standard medium used, cultures of the

former had a diffuse, irregular margin and spread rather slowly, while those of the latter were compact and spread more quickly. Large inocula (1 cu. mm.) of relatively young mycelium of DH_C cultures of any size developed as DH_C, whereas similar inocula from older parts of DH_C cultures of over 15 mm. radius grew as DH_F. A large proportion of minute inocula from all parts of a comparatively young DH_C culture developed as DH_F. It was established that DH_C and DH_F may develop, respectively, from two branches of the same hypha or successive portions of one branch. It is concluded that a DH_C culture contains the properties of DH_C and DH_F and that the influence of DH_C on any part of the culture decreases with age. Apparently, the properties of the two strains are distributed generally throughout a DH_C mycelium and are present together in a single hypha, in which, however, they may be spatially separated, since the smaller the hyphal fragment used as inoculum the greater the probability that DH_F will appear.

A young DH_C mycelium is able to convert a culture of DH_F into DH_C, as all inocula composed of DH_C mixed with or in contact with an equal proportion (or more) of DH_F develop as DH_C. Established DH_F cultures not exceeding 7·5 mm. in radius when inoculated with a relatively minute fragment of DH_C at the centre or periphery assume the rate of spread and external appearance of DH_C, larger cultures being partly converted. Fusion between the hyphae of the two strains occurred under certain conditions, and it is suggested that it is as a result of fusion that DH_C is able to influence DH_F.

Diseases of Potatoes.—*Min. of Agric. and Fish. Collected Leaflets* 3, 70 pp., 3 col. pl., 27 figs., 1934.

These leaflets (collected in portfolio form) issued by the Ministry of Agriculture and Fisheries contain concise, practical notes on the symptoms, causes, and control of the principal fungal and other diseases of potatoes in England, a section also being devoted to the less important diseases. The text is illustrated with useful plates designed to facilitate diagnosis.

Ducomet (V.) & Diehl (R.). **La culture en montagne et les maladies de dégéneresscence de la Pomme de terre.** [Mountain cultivation and degeneration diseases of the Potato.]—*Ann. Agron.*, iv, 3, pp. 355–372, 1 fig., 1 graph, 1934.

In this expanded account, in which full details are given, of their comparative observations on the yield and susceptibility to degeneration diseases of potato seed-tubers cut in two and the halves grown at high and low altitudes, respectively, in France [*R.A.M.*, xiii, p. 535; see also ibid., xiv, p. 77], the authors state that under the conditions prevailing during their experiments virus contamination at the higher altitude took place rather late in the season, so that medium-early and medium-late varieties such as Bintje and Institut de Beauvais to a large extent escaped attack. That the seed of these two varieties from mountain areas gave a better yield than that obtained from the plains was due not to the specifically mountain origin of the former, but to its better sanitary condition. Late varieties gave about equal yields at

both altitudes, while the very late Fin-de-Siècle × Shamrock gave definitely better yields at low than at high elevations.

VERPLANCKE (G.). **Sur une forme nouvelle de la 'bigarrure', maladie à virus filtrant de la Pomme de terre.** [On a new form of streak, a Potato disease caused by a filterable virus.]—*Bull. Soc. Roy. Bot. de Belg.*, Sér. 2, xvi, 2, pp. 107–121, 1 pl., 1 fig., 1 diag., 1934.

In 1931 a large number of Industrie potato plants imported from Poland and growing in experimental plots near Ghent developed a form of streak marked by the presence of small, pale yellow, interveinal areas, sometimes confluent, on middle-sized and full-grown leaves and by golden-yellow ones along the secondary veins of the younger leaves. Small black points quickly appeared on the spots, chiefly near where the finer veins unite with the secondary ones on leaves of average size. Visible at first only on the lower, they rapidly showed on the upper surface, while brown necrotic bands visible on both surfaces sometimes appeared on the veins and spread to the petioles and stem, the leaf edges then becoming slightly rolled backwards. Some tubers showed livid, circular, superficial spots, usually generalized but sometimes localized near the eyes; the skin over these lesions wrinkled and sometimes fell in or cracked. The affected plants matured normally, but the yield was reduced. Spread was rather rapid.

Inoculations of potatoes of different varieties as well as of other plants by rubbing and wounding the leaves with a rag dipped in the juice expressed from affected leaves and also by transferring *Myzus persicae* from diseased potatoes to healthy plants are fully described and the results listed and tabulated. Positive results by both methods were obtained on a number of potato varieties. In most instances rubbing gave rise to mosaic symptoms, while insect transmission invariably produced necrotic interveinal spots in the parenchyma and occasionally necrosis of the petiole and stem. Only Industrie tubers developed necrotic spots as a result of the inoculations. No symptoms appeared on the King Edward variety, which is probably a carrier.

The disease somewhat resembled crinkle A [*R.A.M.*, xiii, pp. 258, 464] except that *Datura stramonium* plants inoculated with the juice from the streaked plants developed only a general chlorosis and did not show the light-coloured veins characteristic of this crinkle. In some respects the disease also resembled the form of streak described by Schultz and Raleigh on British Queen potatoes [ibid., xii, p. 388], but differed from it in that the young leaves were attacked first and inoculated tobacco plants developed only a slight necrosis, whereas inoculation of tobacco with the American workers' virus is stated to have produced characteristic spotting.

It is concluded that the disease described in the present paper is a new form of streak of the same type as acropetal necrosis [ibid., xiv, p. 186].

LUNDEN (A. P.) & JØRSTAD (I.). **Investigations on the inheritance of immunity to wart disease (Synchytrium endobioticum [Schilb.] Perc.) in the Potato.**—*Journ. of Genetics*, xxix, 3, pp. 375–385, 1934.

A fully tabulated account is given of the writers' investigations at Oslo, Norway, from 1928–33, on the inheritance of immunity from

wart disease (*Synchytrium endobioticum*) in potatoes [*R.A.M.*, ix, p. 265].

The tubers were placed, rose end downwards, in glass bowls filled with moist sphagnum moss mixed with pulverized dried warts and kept in a room, for the most part in total darkness, the temperature during the winter being maintained at about 18° to 21° C. The trials usually extended from the end of November till the following summer (June to August), during which time four or five series of tubers were tested. Two or three tubers from each plant were tested, and if found free from infection, one was generally laid out again for further trial, the process being repeated if necessary until reliable results were obtained.

Susceptible varieties (e.g., Centifolia) from which seedling families were derived by self-fertilization or by crossing with another susceptible variety, such as Sagerud, Marius, and Louis Botha, yielded exclusively susceptible progeny. All the immune varieties tested (Jubel, Hindenburg, Pepo, Parnassia, Seydlitz, Flourball, and Tannenberg) and four immune individuals derived from crosses between Hindenburg and Centifolia and between Louis Botha and Jubel segregated in an approximately 3:1 immune-susceptible ratio. The crossing of immune with susceptible varieties gave variable results, segregation in some cases occurring in an approximate 1:1 immune-susceptible ratio and in others (with Jubel as the immune parent) in a proportion of 5 immune: 3 susceptible. Divergent results were further obtained in crosses between immune varieties, segregation in some cases taking place in an approximate 3:1 immune-susceptible ratio, viz., Abundance × Jubel and Helvik × Jubel; the cross Golden Lass × Flourball segregates in a rough proportion of 3:5 immune to susceptible, the corresponding ratios for the crosses Dukker × Jubel and Edzell Blue × Jubel being 7:1 and for Kerr's Pink × Jubel 15:1. The offspring of one cross between two immune varieties, Irish Cobbler × Jubel, were immune.

It is concluded that the data secured in these hybridization experiments may be interpreted as follows. X′ is a dominant factor conferring immunity independent of any other immunity factor. X″ is another dominant immunity factor, the effect of which is similar to, or identical with, that of X′. Y and Z are two complementary factors capable of producing immunity when both are present, even in a heterozygous condition, and acting independently of X′ and X″. It is assumed that all these factors are inherited independently of one another. The inferences drawn from these studies of the immunity factors and their interrelations in potato wart do not altogether agree with the conclusions reached by Salaman and Lesley in respect of the identically named factors, X, Y, and Z [ibid., iii, p. 170].

Van Schreven (D. A.). **Kalkgebrek als oorzaak van mergnecrose bij Aardappelknollen.** [Lime deficiency as the cause of medullary necrosis of Potato tubers.]—*Tijdschr. over Plantenziekten*, xl, 11, pp. 225–255, 3 pl., 1934. [English summary.]

The writer's experiments [which are fully described and the resulting data tabulated] at Wageningen indicate that, under certain conditions, potato plants may appear normal, while the tubers show severe symptoms of the condition described by Beatrice Schwarz from the Dutch

East Indies as 'rusty spot' [*R.A.M.*, vi, p. 247]. This name being considered likely to cause confusion, that of 'medullary necrosis' is substituted. The disease has been observed at Wageningen in the King Edward, Eigenheimer, Alberta, Evergood, Unicum, Triumph, Monocraat, Bravo, Thorbecke, Duke of York, and Bevelander varieties in poor, sandy, acid soils, the first-named suffering the heaviest damage and developing symptoms reminiscent of 'hollow heart' [ibid., xiii, p. 722].

A comparison is instituted between the characters of 'medullary necrosis' and that of some analogous disorders, exemplified by concentric necrosis (also known as 'kringerigheid', 'spraing', 'Kringerkrankheit', 'Kringerigheit' (Sorauer, Handbuch der Pflanzenkrankheiten, i, p. 206, 1933), 'Pfropfenbildung', and 'maladie des tâches en couronne' [*R.A.M.*, xiii, p. 650]), 'net necrosis' [ibid., xi, p. 766], and 'pseudo-net necrosis' ('erbliche [hereditary] Eisenfleckigheit' or 'necrosi pseudoreticolare') [ibid., xii, p. 319; xiii, p. 723]. Burr's opinion that spraing is due to *Bacterium rubefaciens* [ibid., viii, p. 398] is not considered to be substantiated by his photographs, which do not convey the typical impression of concentric necrosis. The cause of the latter is not known but it may be contracted by the tubers through the soil. Net necrosis is caused by the leaf roll virus [ibid., ix, p. 477; xiii, p. 797] and develops solely as a result of primary infection by grafting or by aphid (*Myzus persicae*) transmission. Pseudo-net necrosis is also due to a virus transmissible by aphids [ibid., ix, p. 483].

The fact that medullary necrosis is a disease of acid soils led the author to carry out studies on the effect of calcium deficiency on potatoes in water and glass-sand cultures. In one series of water cultures Duke of York plants grown first for 30 to 38 days in poor river sand, supplemented by the necessary nutrient elements, were then transferred to five different nutrient solutions, in three of which calcium was absent or deficient. The plants in these solutions showed no marked foliar symptoms, but developed distinct necrotic spots in the parenchyma of the tubers, though there were no external signs of these. The medullary necrosis usually began as a diffuse brown discoloration within the vascular ring at the heel end of the tuber. Tuber symptoms characteristic of medullary necrosis further developed in the President and Franschen varieties when calcium was omitted from the culture pots containing either ordinary glass-sand or the same material washed with concentrated mercuric chloride and then with tap water for at least twelve hours. These results show that, as in concentric necrosis and pseudo-net necrosis, the medullary necrosis consequent upon calcium deficiency may induce tuber symptoms without any corresponding foliar manifestations.

MILES (L. E.). **Treatment of Sweet-Potato plants for the control of black rot.**—*Phytopath.*, xxiv, 11, pp. 1227–1236, 1934.

The results [which are fully discussed and tabulated] of two years' experiments in the control of sweet potato black rot (*Ceratostomella fimbriata*) [*R.A.M.*, xiv, p. 118] in Mississippi showed that immersion of the stems and roots of plants grown for transplanting in 25 per cent. copper-lime dust or 20–20–50 Bordeaux mixture may safely be practised in cases where the period of storage and transit between lifting and

transplanting is not expected to exceed five days. No appreciable reduction in stand or yield resulted from either of these treatments.

WATANABE (T.). **Studies on the physiologic specialization in Fusarium sp. causing the stem rot of Sweet Potatoes. I. Cultural characters and the influence of temperature upon the mycelial growth. II. The influence of hydrogen-ion concentration of media upon the mycelial growth.**—*Bull. Utsunomiya Agric. Coll.*, Sect. A, i, 5, pp. 37–51; ii, 1, pp. 1–17, 3 pl., 1 graph, 1934. [Japanese, with English summary.]

The cultural characters of a species of *Fusarium* responsible for sweet potato stem rot in Japan, and the influence of temperature on its mycelial growth were studied in 40 isolations from different localities. Three types of the fungus, differing in vegetative development and sporulation could be recognized, namely, the mycelial, sporodochial, and pionnotal. As regards cultural characters eight growth types were distinguishable, while judging by temperature requirements, the 40 strains fell into three groups with optima for mycelial development at 25°, 25° to 30°, and 30° C., respectively. Both mycelial and conidial development were favoured by an alkaline reaction of the medium, but pigmentation was more abundant towards the acid side. Six growth types were differentiated, varying in their rate of mycelial development.

NISAKADO (Y.), MATSUMOTO (H.), & YAMAUTI (K.). **Comparative studies on two Rice fungi: the foot-rot-fungus in India and the 'bakanae'-fungus in Japan.**—*Ber. Ōhara Inst. Landw. Forsch.*, vi, 3, pp. 449–466, 1934.

A fully tabulated account is given of the writers' comparative studies on the fungi responsible for (*a*) foot rot of rice in India [*R.A.M.*, xii, 719] and (*b*) 'bakanae' disease of the same host in Japan (*Gibberella fujikuroi*) [ibid., xiii, p. 396; xiv, p. 120]. Two similar strains of the former from Madras and four more variable ones of the latter from various parts of Japan were used in the investigations, the results of which indicated a close agreement between the two organisms as regards the shape and size of their micro- and macroconidia and their pathogenicity to rice, but revealed a number of clear-cut physiological differences especially in the divergent colour and shape of the colonies on various culture media. No comparison of perithecial stages was made, but in a letter to the senior author S. Sundararaman stated that the Madras fungus was identified by S. F. Ashby and H. W. Wollenweber as *Fusarium moniliforme* var. *majus*, previously shown to be the conidial stage of the bakanae fungus, *Gibberella* (*Lisea*) *fujikuroi* [ibid., xii, p. 590].

RADEMACHER (B.). **Krankheitsbild und Verhalten der verschiedenen Kulturpflanzen auf urbarmachungskranken Böden.** [Pathological symptoms and reaction of the various cultivated plants on reclamation-diseased soils.]—*Deutsche Landw. Presse,* lxi, 47, p. 581; 48, p. 593, 5 figs., 1934.

In Germany the reclamation disease [*R.A.M.*, xiii, p. 323; xiv, p. 160]

is stated to occur predominantly on the swampy heath soils of Hanover, Oldenburg, and Schleswig-Holstein, being also found, however, in the Lower Rhine district, northern Westphalia, Mecklenburg, Altmark, with sporadic cases in Pomerania, East Prussia, and the Grenzmark.

The symptoms of the disturbance on various cultivated plants are briefly described. They are most conspicuous on oats, an affected field of which acquires a whitish-green shimmer giving rise to the apt local name of 'white sickness'. A prominent feature of the disorder is the continuous formation of new haulms from June onwards, even by the stubble after mowing. The black marsh oats of Rotenburg, Oldenburg, and Bremen origin, though comparatively resistant to reclamation disease, benefit to some extent by the application of copper sulphate, which has been extensively recommended against the disease.

In barley the bleaching takes a yellow rather than white tinge; the upper leaves show a marked tendency to rolling, often accompanied by marginal curling, and the ears, when formed at all, are liable to be empty. The four-rowed summer barleys suffer least from the disorder. Copper sulphate augments the yield.

Rye is usually little affected by reclamation disease, but in severe cases there may be a whitish-yellow spotting and premature shrivelling of the leaves, drooping of the ears, and scanty grain. The results of copper sulphate treatment are conflicting, but in a general way rye may safely be cultivated on 'sick' soils.

Wheat is even less well adapted than barley to cultivation on heath soils, but attempts are made here and there in north Germany to grow it. The symptoms of reclamation disease in this crop are very pronounced, the leaves being covered with longitudinal white stripes and ear formation rudimentary or absent. On soils of the type under discussion a mixture of cereals (summer rye, oats, and barley) is advocated as less liable to the disease than a single crop.

Maize generally tillers luxuriantly on heath soils but yields poorly. In pot tests the results of copper sulphate treatment were satisfactory in mild but not in severe cases of reclamation disease.

Many of the more desirable grasses, e.g. dog's tail [*Cynosurus cristatus*] appear to be gradually dying out on the soils under observation as a result of the 'white sickness', and further investigations on this aspect of the disease should be undertaken.

Copper sulphate (1 doppelzentner per hect.) has been found to produce a valuable increase in the yellow lupin [*Lupinus luteus*] and serradella [*Ornithopus sativus*] yield on sick soils.

Red clover [*Trifolium pratense*] suffers heavy damage from the reclamation disease, expressed in pallor of the leaves sometimes accompanied by a dry, brown spotting spreading inwards from the margins. The basal leaves are abnormally large while the foliar texture as a whole is flimsier than in healthy plants; flowering is scanty and late. A copper sulphate application has given increased yields.

Swedes and turnips are also liable to severe injury on heath soils, characterized by marked stunting and leaf discoloration and shrivelling, the large, yellowish-white patches spreading inwards from the margin. Copper sulphate has given promising results in this crop also.

Brandenburg (E.). **Über die Bedeutung des Kupfers für die Entwicklung einiger Pflanzen im Vergleich zu Bor und Mangan und über Kupfermangelerscheinungen.** [On the importance of copper in the development of certain plants in comparison with boron and manganese and on copper deficiency manifestations.]—*Angew. Bot.*, xvi, 6, pp. 505–509, 1934.

In this paper, which was read at a conference of the Applied Botany Society at Marburg in 1934 and followed by a discussion, the author briefly summarizes the results of his studies on the relation of copper deficiency in the soil to the reclamation disease of oats and other cereals and fodder plants (also known as 'Heidemoorkrankheit' and 'Weissseuche') [*R.A.M.*, xiii, p. 57 and preceding abstract]. In this connexion reference is also made to two analogous disorders, namely, heart and dry rot of beets [ibid., xiv, p. 73] and grey speck of oats [ibid., xiv, p. 122], the one associated with boron and the other with manganese deficiency.

Abe (T.). **Studies on a new dry-rot disease of the bulb of Crocus sativus L. caused by Fusarium bulbigenum Cke. et Mass. var. blasticola (Rostr.) Wr.**—*Trans. Tottori Soc. Agric. Sci.*, iv, 3, pp. 212–228, 2 pl., 1933. (Japanese, with English summary.) [Abs. in *Biol. Abstracts*, viii, 9, pp. 2153–2154, 1934.]

In the Kyoto district of Japan saffron (*Crocus sativus*) bulbs and roots are attacked in the field by *Fusarium bulbigenum* var. *blasticola* [*R.A.M.*, xiii, p. 261] exclusively from the end of April to the end of May, i.e., about the time of digging. Inoculation experiments with the fungus gave positive results on saffron bulbs and seedlings but not on onion seedlings. The optimum temperature for mycelial growth appeared to be near 28° C., with a minimum between 8° and 14° and a maximum above 40°. In synthetic, peptone-containing solutions the optimum hydrogen-ion concentration for the development of the fungus was P_H 3·3 to 5·6, with a potential range from 2·2 to 8. Both the incidence and severity of infection were slightly higher in arid than in humid soils, and the disease reached a climax at a soil temperature of 32°; below 20° the symptoms were negligible.

Baker (R. E. D.). **A threadblight of the Tonca Bean.**—*Trop. Agriculture*, xi, 11, pp. 293–294, 1 pl., 1934.

Tonca bean (*Dipteryx odorata*) trees in the Las Cuevos district of Trinidad were found in 1934 to be seriously attacked by a thread blight which had practically defoliated a considerable number of ten- to fifteen-year-old trees. Cultural studies of the blight at the Imperial College of Tropical Agriculture showed that in its general appearance and in its cultural reactions it was identical with the marasmioid thread blight of coffee (M_2) and the marasmioid thread blight (M_3) of grapefruit recently described by Briton-Jones and the author [*R.A.M.*, xiii, p. 540]. It appeared, however, to be somewhat exceptional in that it occurred in a fairly open field at the beginning of the wet season after a long and severe dry season, though the district where it was found is one of high rainfall, and normally high humidity. It is believed that

the disease could be controlled successfully by reducing further the humidity around the trees.

DEMANDT (E.). **Samenvatting van de resultaten der vakkenproeven van oogstjaar 1934 over verschillende onderwerpen.** [Summary of the results of plot tests during the harvest year 1934 on various lines of investigation.]—*Arch. Suikerind. Nederl.-Indië*, Deel II (*Meded. Proefstat. Java Suikerind.*), *1934*, 26, pp. 937–946, 1934.

The following item of phytopathological interest occurs in this report. Notwithstanding certain discrepancies in the statistical data, it was apparent from the results of five tests that the use of mosaic-diseased plant material of P.O.J. 2967 cane in Java adversely affects both sugar production and total yield as compared with the same variety raised from healthy setts [*R.A.M.*, xiii, p. 654; xiv, p. 191]. The maximum sugar yield of [the resistant] P.O.J. 2878 variety was intermediate between those of the two series of P.O.J. 2967. The amount of mosaic developing in the P.O.J. 2967 plots from healthy plant material ranged from 8 to 99 per cent.

SARKAR (B. N.) & DUTT (K. M.). **Effect of mosaic disease on the tonnage and the juice of Sugarcane in Patna.**—*Indian Journ. Agric. Sci.*, iv, 5, pp. 797–802, 1934.

A summarized account is given of experiments in 1933–4 at Patna, South Bihar, on the same lines as those of McRae and Subramaniam in North Bihar [*R.A.M.*, xiv, p. 191], the results of which showed that the mean emergence of shoots in mosaic-free and mosaic-infected plots of Co. 213 sugar-cane was 16·9 and 15·9 per cent., respectively, after twelve weeks, and 95·9 and 84·3 per cent. after sixteen weeks, the difference between the last two figures, due to a greater degree of tillering in the mosaic-free canes, being highly significant statistically. The mosaic-infected plots yielded 19 per cent. less in weight of stripped cane, and the calculated juice was less by 19·4 per cent., this difference being also statistically significant. The difference in brix was also in favour of the mosaic-free plots.

BOURNE (B. A.). **Some pathological observations on Sugar-Cane × Sorghum hybrids in Florida.**—*Phytopath.*, xxiv, 11, pp. 1314–1315, 1934.

In the course of a detailed two-year study in Florida on certain morphological and structural characters in 58 hybrids between the P.O.J. 2725 sugar-cane variety and Texas Seeded Ribbon sorghum, notes were made on the occurrence among them of some well-known diseases.

P.O.J. 2725 does not appear to contract mosaic in the State notwithstanding its extensive commercial cultivation and widespread exposure to infection. It is also practically immune from red rot of the sheath (*Colletotrichum falcatum*) but more or less susceptible, according to environmental conditions, to eye spot (*Helminthosporium ocellum*) [*R.A.M.*, xiv, p. 57], brown stripe (*H. stenospilum*), and brown spot (*Cercospora longipes*) [ibid., xii, p. 467]. The Texas Seeded Ribbon

sorghum variety has commonly been found infected by mosaic in close proximity to the hybrid plots, but not by any of the other leaf or sheath diseases occurring in the latter. It suffers considerably, however, from leaf rust (*Puccinia purpurea*) [ibid., x, p. 653]. Observations to date on the reaction of the progeny of the above-mentioned cross to the diseases in question indicate that some two-thirds are susceptible to the two species of *Helminthosporium*, one-third to *C. longipes*, and one-fourth to *Colletotrichum falcatum*. Neither mosaic nor leaf rust has been detected in the hybrids as yet.

Overholts (L. O.). **Mycological notes for 1933.**—*Mycologia*, xxvi, 6, pp. 502–515, 2 pl., 1 fig., 1934.

In continuation of previous notes of the same series [cf. *R.A.M.*, xiii, p. 183], the writer lists 38 species of fungi (three new) collected in the United States. Notes are given on many of these. *Ascochyta lethalis* was found causing heavy damage to *Melilotus officinalis* in Pennsylvania, this being apparently the first record for the State.

Corticium vagum Berk. & Curt. [ibid., iii, p. 741; vi, p. 125; ix, p. 739] is a common occupant of the under sides of logs of both coniferous and deciduous trees in Pennsylvania. It may be readily recognized by its fusoid or *Euglena*-shaped spores. The hyphae are 6 to 9 μ in diameter and are devoid of clamp-connexions. At times it apparently revives for two or three years in succession, and may then attain a thickness of 400 μ and show a compactness of structure contrasting with its usual thin, hypochnoid condition. There are stated to be some fifty collections of the fungus in the State herbaria.

Jørstad (I.). **Fungi.**—*ex* Plants of Gough Island (Diego Alvarez).—*Det. Norske Videnskaps-Akad. i Oslo, Scientific Results of the Norwegian Antarctic Expeditions 1927–1928 et sqq.*, pp. 11–12, 1 fig., 1934.

Besides describing *Puccinia goughensis* n.sp. [with a Latin diagnosis] on *Apium goughense*, the author has found a *Septoria* on the same host from Gough Island (Antarctic) agreeing with the description of *S. apiicola* Speg. from Tierra del Fuego. On comparing this with the *Septoria* on celery in Norway, it was found to resemble closely the form producing large spots [*R.A.M.*, xiii, p. 559], referred by recent workers to *S. apii* Chester, and it is concluded that the latter name is a synonym of *S. apiicola*.

Hotson (J. W.). **Key to the rusts of the Pacific Northwest.**—*Univ. of Washington Publ. in Biol.*, iii, 193 pp., 39 figs., 1934.

This annotated monograph lists all the rusts (Uredinales) reported for the four States, Washington, Oregon, Idaho, and Montana, under the family and genus (arranged alphabetically) of the host on which they occur [cf. *R.A.M.*, xiii, p. 728]. A key for identification is provided when there are more than one rust under any host-genus. Some explanatory notes on the morphology of the Uredinales are given in the introduction, and indices of hosts and rusts are appended.

Karling (J. S.). **A saprophytic species of Catenaria isolated from roots of Panicum variegatum.**—*Mycologia*, xxvi, 6, pp. 528–543, 2 pl., 3 figs., 1934.

A species of *Catenaria*, isolated from sterilized *Panicum variegatum* roots placed in a battery jar containing young growing *Eriocaulon septangulare* plants, has been successfully grown in a wide range of autoclaved vegetable and animal tissues, including nematodes, insects, algae, mosses, ferns, and angiosperms, amongst which dead onion roots proved the most favourable tissue for the development of the thallus. The fungus produces an abundance of predominantly uniciliate, occasionally bi- or triciliate zoospores of very variable dimensions, those with more than one cilium being thought to be possibly cases of imperfect cleavage. Two cases of fusion between uniciliate zoospores, however, were observed.

Attention is drawn to the close resemblance between the organism under observation and the liver fluke [*Fasciola hepatica*] parasite, *C. anguillulae* [*R.A.M.*, xii, p. 93].

Van Luijk (A.). **Pythium de Baryanum Hesse em. de Bary.**—*Meded. Phytopath. Lab. 'Willie Commelin Scholten'*, Baarn (Holland), xiii, pp. 23–28, 1934. [German.]

Exception is taken by the writer, in connexion with his studies on a fungus corresponding with de Bary's and Butler's descriptions of *Pythium de Baryanum* Hesse isolated from diseased grass roots in Holland and briefly described, to Drechsler's proposed transfer of many of the parasitic records of this species to *P. ultimum* Trow [*R.A.M.*, vi, p. 510].

Assuming that de Bary's emendations of Hesse's original diagnosis were justified—and this, in the writer's opinion, can scarcely be called in question—two courses are open. Either *P. de Baryanum* must be interpreted in de Bary's sense and the name *P. de Baryanum* Hesse emend. de Bary retained, or the species must be cancelled on the basis of incorrect diagnosis and probable absence of type material—an alternative to be adopted only in the last resort if hopeless confusion with old names is to be avoided. Drechsler's grounds for the retention of *P. ultimum* as a species distinct from *P. de Baryanum* are not considered to be free from objection; the writer is inclined to regard the differences as inadequate to warrant a separation. In all probability, *P. de Baryanum*, like many widespread fungi, is not a genetic unit. Neither parasitism nor the presence or absence of zoospores would appear to constitute sufficient grounds for specific separation in the case under discussion, and in view of the extreme variability of the antheridia of *P. de Baryanum*, the supposed differences between these organs are a very unreliable criterion.

Manil (P.). **Note sur les nécroses foliaires du Tabac dans les cultures de la vallée de la Semois en 1934.** [A note on the leaf necroses of Tobacco grown in the Semois valley in 1934.]—*Bull. Inst. Agron. et des Stat. de Recherches de Gembloux*, iii, 4, pp. 367–377, 1934. [Flemish, German, and English summaries.]

In July, 1934, tobacco in the Semois valley, Belgium, showed a white

necrotic leaf spotting. On some plants of normal height the spots were usually 0·5 to 3 mm. in diameter, sparsely and uniformly scattered and most numerous on the lower leaves, while on others they were 0·5 to 8 mm. in diameter, circular, elongated in the direction of a vein or arranged in rings, and were chiefly present on the middle and upper leaves; many leaves were affected only in one place, generally near the tip or base on either side or both sides of the midrib. Occasionally, the leaves on one side only of a plant were affected. No chlorosis or mosaic was present on these plants. On others, below normal height, the spots resembled in position and shape those of the second type mentioned above; some of the upper leaves were unspotted but were chlorotic, asymmetrical, with the edges turned back towards the base, and the midrib contorted. The necroses that eventually appeared on these leaves occurred as brown lines or dots. All varieties grown were equally susceptible.

No fungus or bacterium was found in the affected material, and the evidence showed that the disease was not due to mineral deficiency. Serological examination by Gratia's method [*R.A.M.*, xiii, p. 542] demonstrated that it was not attributable to the X potato virus either alone or in association with others [ibid., xiv, p. 186]. On three occasions the virus of ordinary tobacco mosaic was isolated from the spots, but it was not possible to determine whether or not it was associated with any other virus. From the evidence obtained the author concludes that the condition is due to one or more specific viruses.

Stanley (W. M.). **Chemical studies on the virus of Tobacco mosaic. II. The proteolytic action of pepsin.**—*Phytopath.*, xxiv, 11, pp. 1269–1289, 2 graphs, 1934.

A comprehensive, fully tabulated account is given of the writer's experiments on the proteolytic action of pepsin on tobacco mosaic (ordinary, masked, yellow, and aucuba strains), *Nicotiana glutinosa* and in some cases *Phaseolus vulgaris* being used as the test plants.

It was found that, in striking contrast to the results obtained with trypsin [*R.A.M.*, xiv, p. 199], pepsin at concentrations of 0·1, 1·0, or 10 mg. per c.c. of diluted purified virus produced no appreciable immediate effect on the infectivity of any of the strains at P_H 3 to 8. Even on prolonged digestion at 37° C. the action of pepsin on the viruses was negligible at P_H 7 and 8 and extremely slight at P_H 5 and 6; slow inactivation took place, however, at P_H 4, while at P_H 3 the process was rapid at 37° but no reduction of infectivity occurred at —15° even on protracted standing (up to 97 days). Pepsin-virus digestion mixtures, containing inactive virus, exert no appreciable immediate effect on the infectivity of virus added to such compounds, indicating that substances toxic to the virus or test plant are not formed as a consequence of the digestion of virus. Negative results followed attempts to restore the infectivity of pepsin-inactivated virus.

From the facts that pepsin inactivates virus only under conditions favouring proteolytic activity, and that the rate of such inactivation varies directly with the concentration of active pepsin, it is concluded that the inactivation of virus is due to the proteolytic action of pepsin. Hence it may further be deduced that the tobacco mosaic virus is either

a protein or some very closely related substance hydrolysable with pepsin [cf. ibid., xiii, p. 329].

PARK (M.). **Frog-eye or eye-spot disease of Tobacco.**—*Trop. Agriculturist*, lxxxiii, 5, pp. 322–324, 1 col. pl., 1934.

A brief, popular account is given of the frog-eye leaf spot disease of tobacco caused by *Cercospora nicotianae* [*R.A.M.*, xiii, p. 686], which is believed to be likely to affect considerably the prices obtained for cured tobacco produced in Ceylon, where tobacco of good quality and high grade is now being grown. Preventive and control measures are discussed in some detail.

AINSWORTH (G. C.), BERKELEY (G. H.), & CALDWELL (J.). **A comparison of English and Canadian Tomato virus diseases.**—*Ann. of Appl. Biol.*, xxi, 4, pp. 566–580, 2 pl., 1934.

The results [which are tabulated] of their comparative studies of virus diseases of the tomato show that the more common forms of these troubles occur both in England and in Canada. These are the ordinary or mild tomato mosaic caused by Johnson's tobacco virus No. 1 [*R.A.M.*, xiv, p. 197]; the 'aucuba' mosaic caused by Johnson's tobacco virus No. 6, which it is suggested should be called yellow mosaic of the tomato, since the former name has in the past led to some confusion with the aucuba mosaic of the potato; single-virus streak caused by a virus which is described for the first time in this paper under the name tomato streak virus No. 1, with an indication of its reactions on the tomato, tobacco, *Nicotiana glutinosa*, and *Datura stramonium*, and also of its properties; mixed-virus streak caused by a mixture of two or more viruses, this mixture usually consisting of a tobacco mosaic virus or tomato streak virus No. 1 and a potato virus of the X type [ibid., xiv, p. 185]; and spotted wilt. The mixed-virus streak appears to be more frequent in Canada than in England.

Brief accounts are also given of the other virus diseases which affect tomato in Canada, namely, stem-necrosis streak caused by Johnson's tobacco virus No. 9 and ring mosaic [ibid., x, p. 213], neither of which has as yet been recorded in England; a study was also made of the Irish Cobbler potato mosaic [ibid., ix, p. 401], which was found to be caused by a potato virus of the X type, and of Burnett's and Jones's 'latent' and 'virulent latent' potato viruses [ibid., xi, p. 595, and next abstract].

AINSWORTH (G. C.). **A comparison of certain English and Canadian Potato viruses found infecting Tomatoes.**—*Ann. of Appl. Biol.*, xxi, 4, pp. 581–587, 1 pl., 1934.

A brief account is given of the author's studies of the 'latent' and 'virulent latent' potato viruses [see preceding abstract], the first of which is believed to be possibly the same as J. Johnson's tobacco mottle virus [*R.A.M.*, v, p. 119], while the second appears from the literature to be the same as E. M. Johnson's healthy potato virus [ibid., x, p. 60], K. M. Smith's potato virus X, and J. Johnson's tobacco ring spot virus [ibid., vi, p. 501], which is quite distinct from Henderson's and Wingard's ring spot virus [ibid., xi, p. 132]. The two viruses studied were isolated from Canadian tomato material and were compared with authentic potato X

virus supplied by K. M. Smith, a strain of the same virus used at Cheshunt to produce mixed-streak virus, and the potato virus fraction of a mixed-virus tomato streak from Ireland. All these viruses were found to possess the same properties [which are briefly indicated], and when compared on tomato, tobacco, *Nicotiana glutinosa*, and *Datura stramonium* the symptoms caused by them on all the host plants varied from the somewhat virulent type characteristic of the X virus to the mild symptoms typical of the 'latent' virus, the difference between the two extreme types being very marked under all conditions. When mixed with tobacco virus No. 1 and inoculated into tomato each of the potato viruses produced typical streak, the symptoms being most severe when the most virulent potato virus was used, and least so with the mild 'latent' virus. These results, together with the fact that in a special series of experiments preliminary inoculation with the mild latent virus was found to protect the tomato plant against subsequent inoculation with the virulent latent virus [cf. ibid., xii, p. 583], are considered to indicate that all the viruses studied are of the potato X virus type, and it is suggested that they should be designated as the 'virulent X virus' and the 'latent X virus' respectively. It would seem advisable, however, that the latter should receive a special name, for the symptoms produced by it on certain plants are dissimilar to those caused by the virulent form which is identical with the type potato X virus.

CALDWELL (J.). **The control of virus diseases of the Tomato.**—*Journ. Min. Agric.*, xli, 8, pp. 743–749, 1934.

After a brief popular account of the chief virus diseases of the tomato in England, among which ordinary tomato mosaic, streak, and spotted wilt are stated to be the most common, and aucuba or yellow mosaic and 'double virus' streak are less commonly found [see preceding abstracts], the author states that the simplest way to prevent their introduction into glasshouses is the suppression of all weeds growing around the houses. After weeding operations care should be taken to wash the hands thoroughly with soap and water before touching any tomato plants in the houses; the same precaution should also be taken when handling diseased and healthy plants, since it has been definitely shown that most of the infection of the plants in the houses is caused by careless handling. Smoking tobacco, which it is now practically certain is a common source from which tomato plants become infected, should not be used in the houses, or, alternatively, it should be rendered innocuous by heating it to 100° C. for a minute or two. Routine fumigation for the control of insects should be carried on throughout the season, care being taken to clear out all corners and crannies where insects might hibernate.

CHAMBERLAIN (E. E.). **Narrow-leaf—a virus disease of Tomatoes.**—*New Zealand Journ. of Agric.*, xlix, 5, pp. 257–263, 5 figs., 1934.

A brief account is given of the author's preliminary investigation of an apparently hitherto undescribed disease of tomatoes which was first seen in 1933 in plants received from Gisborne and Hastings in New Zealand. During the summer of the same year the trouble became very prevalent in and about Gisborne, 50 per cent. of the crop being infected in two cases, and it recurred during the 1933–4 season in the Poverty

Bay and Hawke's Bay districts. In the field the plants may become infected at any stage of growth, but this frequently occurs between the setting of the first and second fruit trusses. The symptoms (which are very similar in the field and under glass) are first a distinct narrowing and a slight crinkling of the young leaves, becoming intensified as the plant grows until, in severe cases, there is much curling and distortion of the foliage. The disease does not affect the shape of leaves that are fully developed at the time of infection. The upward growth of infected plants is usually not greatly retarded, but the total leaf area is reduced, and the fruit is invariably smaller than normal, inclined to be flattened, and of light weight. Sometimes, however, growth is much retarded, and fruit fails to set on trusses formed after infection. Partial recovery with setting of fruit on the upper trusses was occasionally observed both in the field and under glass.

Inoculation experiments in 1933 showed that the disease is transmissible to healthy tomato plants (Sutton's Best of All) by rubbing the leaves with a muslin moistened with juice extracted from diseased plants (eighteen out of thirty-six inoculated plants), and by the aphid *Myzus pseudosolani* (two out of seven plants). It was also successfully inoculated into tobacco (five out of twelve plants); on this host the most characteristic symptoms were a stunting of the plant and a slight narrowing of the leaves, which were also of a slightly paler green than normal; the flowers, many of which failed to set fruit, were distorted and showed pink and white stripes. The disease was successfully returned from tobacco to tomato, on which the typical symptoms were reproduced.

Remedial measures are very briefly discussed.

PORTE (W. S.). **Notes on the control of transit and storage decays of Tomatoes by the use of chemical washes.**—*Phytopath.*, xxiv, 11, pp. 1304–1312, 1934.

The relative efficacy of a group of chemical washes in the inhibition of the tomato fruit rots caused by *Phoma destructiva* [*R.A.M.*, xiv, p. 182], *Rhizoctonia* [*Corticium*] *solani*, and *Phytophthora terrestris* [*P. parasitica*: ibid., xii, p. 121] was tested under carefully controlled conditions on commercial samples of 'green-wrap' Florida winter tomatoes in storage in 1929 and 1930. The average reduction of infection obtained by three minutes' immersion of the inoculated fruits in hot washes (115° to 122° F.) was 59·5 per cent. for the most effective mixture (1 per cent. borax in 1 to 300 commercial formaldehyde) and 29 per cent. for the least useful (1 per cent. borax and 1 per cent. potash alum). Rinsing the tomatoes in tap water immediately after treatment did not significantly augment the percentage of storage rots, except among the fruits washed in formaldehyde solutions containing other chemicals, in which there was an increase of 9·38 per cent. in the incidence of decay. Most of the *Phoma* infections developing on the stored fruits were natural rots imperceptible at the commencement of storage, and some of them proved resistant to the most effective washes used. No effect on the occurrence of the fruit rot was exercised by the ethylene gas used to accelerate the coloration of the tomatoes.

Tenth Annual Report of the Imperial Forestry Institute, University of Oxford, 1933–1934.—36 pp., 1934.

This report contains (pp. 19–21) the following items of phytopathological interest [cf. *R.A.M.*, xiii, p. 333]. The outcome of inoculations with *Dasyscypha calycina* [ibid., xiii, p. 482] and *Phomopsis pseudotsugae* [ibid., xiii, p. 483] on larch and Douglas fir [*Pseudotsuga taxifolia*], respectively, has so far been almost entirely negative, thus supporting the contention that frost is mainly responsible for the canker of the former and the die-back of the latter host [cf. ibid., xiii, p. 484].

The sixth annual survey of the Forestry Commission showed no significant increase in England of the Dutch elm disease (*Ceratostomella ulmi*) [ibid., xii, p. 334], which was further found to be absent from the part of Scotland inspected.

Phytophthora cambivora and *P. cinnamomi* [ibid., xiii, p. 784] have been isolated from sweet chestnut [*Castanea sativa*] suffering from ink disease in the south of England, and *P. cambivora* and *P. syringae* [ibid., xiii, p. 783] from beech affected by an analogous disorder of the root system. The disease is most virulent in the sweet chestnut and threatens its successful cultivation in the south of England. In both beech and chestnut a correlation appears to exist between liability to infection and soil constitution, the diseases being most prevalent on the more retentive and wetter types.

So far no satisfactory results have been obtained in the attempted isolation of a pathogen from the cankers on poplar (*Populus eugenii*) [ibid., xiii, p. 408]. This disease, or complex of disturbances as it may ultimately prove to be, is scattered throughout England and over a considerable part of Scotland, and may undoubtedly be regarded as one of the major silvicultural problems of the country.

Buisman (Christine J.). **The area of distribution of the Ceratostomella (Graphium) Elm disease.**—*Meded. Phytopath. Lab. 'Willie Commelin Scholten'*, Baarn (Holland), xiii, pp. 35–46, 1934.

Up to March, 1934, *Ceratostomella ulmi* had been found attacking elms in Holland, Belgium, France, Germany, England, Austria, Czecho-Slovakia, Switzerland, Italy, Rumania, Bulgaria, Portugal, Hungary, Jugo-Slavia, and the United States. A report as to its occurrence in Poland requires verification [*R.A.M.*, vii, p. 352].

Goidànich (A.) & Goidànich (G.). **Moria degli Olmi e Scolitidi.** [Elm die-back and Scolytids.]—*Italia Agric.*, lxxi, 10, pp. 941–948, 15 figs., 1934.

This paper on the part played in the dissemination of elm die-back (*Ceratostomella ulmi*) in Italy by the bark beetles *Scolytus sulcifrons* Rey and *S. multistriatus* and the control of these insects is a shorter version of one already noticed from another source [*R.A.M.*, xiv, p. 133].

Goidànich (G.). **La moria degli Aceri.** [The wilt of *Acer* spp.]—*Italia Agric.*, lxxi, 11, pp. 1043–1055, 15 figs., 1934.

Most of the items of information in this comprehensive but succinct review of a two years' study of the tracheoverticilliosis of *Acer campestre*,

A. platanoides, *A. pseudoplatanus*, and *A. negundo* caused in Italy by a *Verticillium* with dark microsclerotia have already been noticed from previous papers by the same author [*R.A.M.*, xii, p. 338; xiii, p. 811]. In harmony with Wollenweber [ibid., ix, p. 6] and others the author refers all the strains of *Verticillium* causing tracheomycosis to *V. albo-atrum*.

MASERA (E.). **Osservazioni sulla 'fersa' del Gelso.** [Observations on the Mulberry 'scourge'.]—*Ann. Tecn. Agrar.*, Rome, vi, 2, pp. 178–184, 1933. [Abs. in *Biol. Abstracts*, viii, 9, p. 2160, 1934.]

A conspicuous degree of resistance to *Phleospora mori* [cf. *R.A.M.*, viii, p. 339] in Italy was shown by the mulberry varieties Filippina, Florio, and Rosa Lombarda. Pruning was of real value in reducing infection owing to the overwintering of the fungus in the young parts of the branches. There must be other factors, as yet unknown, besides temperature, shade, and humidity, which influence the development and spread of the disease. Infected leaves appear to exercise a toxic action on silkworms.

SREENIVASAYA (M.) & RANGASWAMI (S.). **Field studies in the spike disease of Sandal (Santalum album Linn.). I. Observations on the natural dissemination of spike.**—*Proc. Indian Acad. Sci.*, i (*Mem. Indian Inst. Sci.* 26), pp. 143–154, 1934.

The discontinuity in the natural spread of sandal (*Santalum album*) spike [*R.A.M.*, xiv, p. 204] in Madras and its occurrence as isolated outbreaks in areas far removed from all apparent sources of infection may result from a possible transport of virus-infected seed or from long-distance dispersal of the insect vectors effected by wind or other agencies. The possibility of seed transmission of the disease has been experimentally indicated and is discussed in the light of recent studies. There is a frequent association of primary outbreaks of spike with existing or abandoned sites of cultivation and it is suggested that the trees are predisposed to the disease by the denudation of the forests for agricultural purposes.

The parallel spread of mosaics and leaf curls among the associated weed flora and that of spike in sandal is considered to be highly suggestive as indicating a favourable environment for the multiplication of viruliferous vectors. The insect vectors of spike disease were experimentally shown to be most active between April and June, with a secondary climax from October to December. Caging of the sandal plants has been found effectively to screen them from infection, none of those so treated (over 100) contracting spike during a period of $2\frac{1}{2}$ years as compared with 13·4 per cent. infection among the uncaged controls. In another test 9·5 per cent. spike occurred among the uncaged and none in the caged plants.

Grafting experiments on large trees showed that even minute doses of infected tissues (80 to 100 mg.), introduced at a vulnerable point during the critical period for infection (April to June), are sufficient to induce spike.

Hahn (G. G.) & Ayers (T. T.). **Dasyscyphae on conifers in North America. III. Dasyscypha pini.**—*Mycologia*, xxvi, 6, pp. 479–501, 2 pl., 1934.

Continuing their studies on the species of *Dasyscypha* on conifers [*R.A.M.*, xiii, p. 553], the writers found that the large-spored, brown-excipled fungus causing a destructive canker of *Pinus strobus*, *P. monticola*, and *P. albicaulis* in North America, and of *P. sylvestris* in northern Scandinavia, is distinct from the saprophyte *D. fuscosanguinea* [ibid., viii, pp. 424, 745] with which it has hitherto been regarded as identical. The parasite, which appears to be restricted to northern latitudes and high elevations (3,000 to 6,000 ft.) on cold mountain slopes or Arctic pine barrens, is referred to Brunchorst's species *Lachnella pini* (1892) under the new combination *D. pini* (Brunch.) Hahn & Ayers, *D. monticola* Diehl being considered a synonym. The cultural characters of the fungus are described and morphological and physiological data presented in support of its separation from *D. fuscosanguinea*, which is only definitely known to occur in the Austrian Tyrol.

In North America *D. pini* was first collected in 1922, though it is believed to have been present for many years. It occurs on *P. albicaulis* in British Columbia, on *P. monticola* in British Columbia, Washington, and Montana, and on *P. strobus* in Michigan. The forms isolated from the three American pines were found to agree satisfactorily with the Swedish material collected on *P. sylvestris* in the Arctic region. On the latter host in Norway *D. pini* was associated with *Phacidium infestans* [ibid., xiii, p. 814].

Verrall (A. F.). **The resistance of saplings and certain seedlings of Pinus palustris to Septoria acicola.**—*Phytopath.*, xxiv, 11, pp. 1262–1264, 1934.

Observational and experimental evidence is adduced to show that one of the factors determining the resistance of some seedlings and most older plants of *Pinus palustris* to the brown spot needle blight fungus (*Septoria acicola*) in Louisiana [*R.A.M.*, xiii, p. 607] is the capacity of the host to produce resin, which impedes the advance of the fungus. The external sign of resin formation is a so-called 'bar-spot', i.e., a small area encircled by a yellow zone extending from under 1 to 3 mm. from the brown lesion. Such spots contain only a sparse amount of mycelium in the mesophyll layer, many of their cells are filled with resin, and only a few fructifications of the fungus are present. A similar phenomenon occurs in various other pines.

Lanphere (W. M.). **Enzymes of the rhizomorphs of Armillaria mellea.**—*Phytopath.*, xxiv, 11, pp. 1244–1249, 1934.

The enzymes extracted from the rhizomorphs of *Armillaria mellea* isolated from a well [*R.A.M.*, viii, p. 281] curbed with Douglas fir [*Pseudotsuga taxifolia*] at Seattle, Washington, were diastase, inulase, invertase, rennet, oxidase, peroxidase, and catalase.

Collins (J. F.). **Treatment and care of tree wounds.**—*U.S. Dept. of Agric. Farmers' Bull.* 1726, 38 pp., 14 figs., 11 diags., 1934.

This bulletin (a revision of No. 1178, entitled 'Tree Surgery', in the

same series) contains in a popular form much valuable information on neglected wounds, the structure and life processes of trees, causes of injury, and the various operations incidental to the prevention of damage and treatment of wounds. Laws regulating the commercial practice of tree surgery are stated to be in force in Connecticut and Rhode Island.

Miller (V. V.) & Meyer (Mlle E. I.). Влияние высушивания пораженной домовыми грибами древесины на их жизнеспособность. [Effect of desiccation of wood infected by house fungi on their viability.]—ex *Грибные повреждения древесины. Сборник работ Лаборатории Хранения Древесины ЦНИИМОД, I* [*Injuries to timber caused by fungi. Collection of the Works of the Laboratory for Timber Storage of ZNIIMOD, I*], pp. 5–22, Госуд. Лесное Техн. Издат. [State Forestal Tech. Publ. Office], Moscow, 1934.

The authors tested the viability at regular intervals up to 11½ months of the mycelium of *Coniophora cerebella* [*C. puteana*: *R.A.M.*, xiv, p. 69], *Merulius lacrymans*, and *Poria vaporaria* in pine wood blocks intermittently sterilized for three hours daily at 56° to 66° C. for three days and kept after inoculation under incubation for a month and a half, until they were fully permeated, when they were transferred to desiccators, in which the atmospheric humidity was maintained throughout at 77·2, 62·3, 49, 33·4, and 21·5 per cent., respectively. The results [which are tabulated] showed that the highest resistance to desiccation was exhibited by *P. vaporaria*, which was found to be still viable, although in a much weakened condition, after 212 days' sojourn in the atmospheres with 21·5, 33·4, and 49 per cent. humidity; at the end of the experiment it was still capable of producing rapid and vigorous new growth when removed from the atmosphere with 77·2 per cent. humidity, and of making some growth when removed from that with 62·3 per cent. *C. puteana* was found to be dead after 81 days at 21·5 and 33·4 per cent. humidity, after 94 days at 49 per cent., and after 343 days at 62·3 per cent., at which time, however, the cultures kept at 77·2 per cent. were still capable of giving rapid and vigorous new growth. The least resistant proved to be *M. lacrymans*, the viability of which was already considerably weakened after 54 days and entirely lost after 81 days at 21·5 per cent. humidity; it was dead after 152 days at 33·4, 212 days at 49 and 62·3, and 343 days at 77·2 per cent. humidity.

In a 60 cm. long piece cut from a wooden beam badly rotted by *M. lacrymans*, which was kept at room temperature in Moscow at humidities ranging from 30 to 45 per cent., the fungus was dead throughout the block after 5 months; in a 6 cm. thick board, also infected by *M. lacrymans*, the fungus died out in under 4½ months in a room in which humidity fluctuated between 40 and 50 per cent.

At 77·2 per cent. humidity *P. vaporaria* formed a very thin, hyaline covering on the pine blocks and continued its destructive action up to the end of the experiment, so that the blocks were reduced to a friable mass; at 62·3 per cent. no aerial mycelium formed, and the submerged hyphae gradually passed into a resting stage, the blocks remaining much firmer and losing considerably less weight than at 77·2; at the other three humidities tested the rotting process was soon stopped, and the

consistency of the blocks was hardly altered. *C. puteana* behaved in much the same way, but never formed an aerial mycelium. The rotting activity of *M. lacrymans* was very soon stopped at all the humidities tested, indicating the facility with which its mycelium passes into a resting stage under adverse conditions.

These investigations suggest that even large-sized infected timbers may be comparatively safely used for constructional purposes, provided that they have been dried out sufficiently to ensure the death of the organisms or are not subjected in the buildings to humidities above 65 to 70 per cent. In the latter case, the buildings should be examined at least twice a year by experts, since the resting mycelium may possibly revive and resume its destructive activity even after a long time, if conditions become favourable. The results are also discussed at some length in their bearing on certain other problems in the control of house fungi in infected premises.

Miller (V. V.) & Meyer (Mlle E. I.). Исследования по стойкости древесных пород в отношении гниения. [Investigations on the resistance to decay of various species of wood.]—ex *Грибные повреждения древесины. Сборник работ Лаборатории Хранения Древесины ЦНИИМОД, I* [*Injuries to timber caused by fungi. Collection of the Works of the Laboratory for Timber Storage of ZNIIMOD, I*], pp. 23–39, Госуд. Лесное Техн. Издат. [State Forestal Tech. Publ. Office], Moscow, 1934.

The experiments briefly described in this paper consisted in placing $1 \times 2 \times 2$ cm. air-dry blocks of intermittently sterilized [see preceding abstract] wood of chestnut, oak, elm (*Ulmus campestris*), ash, beech, maple (*Acer platanoides*), Siberian larch [*Larix sibirica*], and birch on vigorously developing pure cultures of *Coniophora cerebella* [*C. puteana*] and *Merulius lacrymans* on sterilized hothouse soil in flasks kept in a dark, damp room at temperatures fluctuating between 16° and 21°, and determining the loss of dry weight caused by each fungus at the end of four months. The larch, maple, birch, and beech blocks were entirely covered by aerial mycelium very soon after the start of the experiments, the oak blocks being somewhat, and the chestnut and elm considerably less densely covered; elm wood, in particular, appeared to exert a repellent action on the mycelium, which extended over a part of its surface only late in the experiment. The results [which are tabulated] showed that the resistance to decay of oak was surpassed by that of chestnut (9 and 4·9 per cent. average dry weight loss, respectively), with elm a good third (14 per cent. loss). All the remaining species were badly rotted, the average dry weight losses ranging from 38·7 per cent. in ash to 64·1 per cent. in birch. In the less resistant species the loss in weight of the different blocks of the same wood was fairly consistent, with deviations from the mean not over 9·6 per cent., but the coefficient of variability in the more stable species was very high, up to 40 to 50 per cent., and even reached 67 and 92 per cent. in oak and elm, respectively, when rotted by *C. puteana*. The method used is evidently not too well adapted for testing the resistance of the more rot-resisting species of wood or of wood impregnated with preservatives, since the variability

in the results may be due to some factor or factors almost impossible to control even under the best experimental conditions, such as, for instance, the degree to which moisture is absorbed by the individual air-dry blocks from the culture substratum, a factor which, in all probability, considerably affects the concentration of the protective substance in certain areas of the blocks by leaching [cf. *R.A.M.*, xiv, p. 3].

In view of the surprisingly high loss in dry weight shown at the end of the experiment by the *L. sibirica* blocks, since this wood is usually considered in Russia to be fairly resistant to rot (unimpregnated railway sleepers of it lasting up to ten years and over), its resistance was again compared to that of birch and pine wood in an experiment, the duration of which was reduced to three months. This shorter time served to accentuate the differences in resistance to rotting of the three species, and showed that the larch wood was the most resistant, with pine coming next, and birch last, but not sufficiently so to recommend its use untreated under conditions conducive to infection with wood-rotting fungi.

Meyer (Mlle E. I.). Черные сучки и сердцевинная темнина Березы и влияние их на загнивание древесины. [Black knots and darkening of the heart wood in Birch in relationship to the initiation of timber rotting.]—ex *Грибные повреждения древесины. Сборник работ Лаборатории Хранения Древесины ЦНИИМОД, I* [*Injuries to timber caused by fungi. Collection of the Works of the Laboratory for Timber Storage of ZNIIMOD, I*], pp. 93–119, 18 figs., Госуд. Лесное Техн. Издат. [State Forestal Tech. Publ. Office], Moscow, 1934.

This is a detailed report of the author's investigation near Moscow in 1932 of a serious defect of birch wood, locally known as 'tcherny soutchok' [black knot]. The trouble is very frequently associated with a reddening or darkening of the heart wood and is particularly prevalent in marshy, waterlogged soils, where from 20 to 44 per cent. of the trees may be affected with it. The black, partially decayed knots, which easily fall out of the wood during its processing, were traced to broken-off snags of lateral shoots on the trunk which are later overgrown by healthy wood. They are produced only when the lateral shoot is broken off at a certain distance from the trunk, so that it is already dead and decaying from the action of saprophytic fungi when submerged by the overgrowth of annual wood. Very short snags, overgrown before they are entirely dead, even when already colonized by the same fungi, form hard, dark, horny knots which are organically joined with the surrounding wood and do not fall out when the wood is worked; these do not depreciate the value of the timber.

The decaying knots are almost invariably bounded by a zone of reddened or darkened wood, harder and tougher than the surrounding white wood; in most cases a similarly discoloured region develops in the centre of the affected trunks, very slowly increasing in diameter, and not delimited by the annual rings but rather sinuous in outline. No fungal mycelium was ever observed in the still hard or decayed portions of the knots, and all attempts to isolate an organism from these parts

gave negative results. Mycelium is, however, usually present in the darkened wood around the knots, and also in the central discoloured zone, sometimes extending into the apparently normal wood beyond, and isolations from these regions yielded 12 fungi, of which only *Stereum hirsutum, Coniophora cerebella* [*C. puteana*], and *Panus stipticus* could be identified in pure culture.

While the condition described above does not cause an active rot as long as the trees remain standing, decay soon sets in in logs cut from them, producing four different types of rot [which are described in some detail], namely, a marble-like rot associated with various species of fungi; a destructive rot caused by *C. puteana*; a light yellow rot caused by *S. hirsutum*: and a grey rot with darker areas, caused by *P. stipticus*. A theoretical explanation is given of the fact that the fungi do not cause active decay in the living trees but regain their rotting power after the death of the latter, and the paper terminates with a brief discussion of possible means of controlling the trouble.

Vakine (A. T.). К вопросу о предохранении бревен летней заготовки от грибных повреждений. [On the problem of the preservation of summer-felled logs from fungal injury.]—ex *Грибные повреждения древесины. Сборник работ Лаборатории Хранения Древесины ЦНИИМОД, I* [*Injuries to timber caused by fungi. Collections of of the Works of the Laboratory for Timber Storage of ZNIIMOD, I*], pp. 40–92, 13 figs., Госуд. Лесное Техн. Издат. [State Forestal Tech. Publ. Office], Moscow, 1934.

This is a detailed account of large-scale experiments in 1931 in the neighbourhood of Moscow to determine the conditions that are least conducive to the development of blue-staining and other lignicolous moulds, and of fungal rots, in summer-felled pine and fir logs stored *in situ*. Comprehensive notes are given on the more important fungi that were observed locally to cause blemishes and decay in the logs, the symptoms produced being briefly described. These are superficial blue staining caused by *Cladosporium herbarum* and *Alternaria humicola* on both hosts; deep-penetrating blue stains in both pine and fir caused by *Ceratostomella piceae, C. pini, C. coerulea, C. imperfecta* n.sp. [see next abstract], and *Hormonema dematioides* [*R.A.M.*, xiv, p. 68], and in pine alone by *Endoconidiophora coerulescens* [loc. cit.]; a reddish-brown (cacao-coloured) slow rot caused very commonly in fir but more rarely in pine by *Stereum sanguinolentum*; and a coffee-coloured one, more especially in pine, caused by a mycelium which has not yet been identified. Among the other fungi isolated special mention is made of a deep-seated, yellowish-pink or light orange discoloration in streaks, associated with fruiting bodies of *Corticium leve*, light-brown or whitish, frequently water-soaked discolorations caused by *Peniophora gigantea* [ibid., viii, p. 3], and a very slow, dirty grey, wet rot caused by *Schizophyllum commune*. A passing mention is finally made of very superficial yellow, delicate pink, cherry-coloured, and purple discolorations caused by moulds such as *Fusarium* and *Penicillium* spp., which, however, did not affect the properties of the timber and usually disappeared entirely as the wood dried.

While it is freely admitted that experiments during one season alone are not conclusive, the results of the main investigations indicated that effective protection against infection with these fungi, and also against too rapid desiccation leading to the formation of cracks in the timber and from attacks by bark-boring insects, was afforded by piling the unbarked pine and fir logs on low supports or directly on damp earth not later than 15 days after felling, into compact piles of 20 to 30 logs or more, and covering them with a thick layer of conifer branches; this should be supplemented by painting the cut ends of the logs with either 3 per cent. sodium fluoride or a 3 to 5 per cent. iron sulphate solution. Fir logs showed also little injury when they were stripped of the outer bark down to the bast, which should be left as uninjured as possible, and stored in loose piles, each row of logs being separated from the next by transverse supports.

MILLER (V. V.) & TCHERNTZOFF (I. A.). Новые виды грибков возбудителей синевы древесины. [New species of fungi causing blue stain of wood.]—ex *Грибные повреждения древесины. Сборник работ Лаборатории Хранения древесины ЦНИИМОД, I* [*Injuries to timber caused by fungi. Collection of the Works of the Laboratory for Timber Storage of ZNIIMOD, I*], pp. 120–128, 11 figs., Госуд. Лесное Техн. Издат. [State Forestal Tech. Publ. Office], Moscow, 1934.

A detailed account is given of the authors' [the junior of whom transliterates his name as Cernzow] morphological and cultural studies of three apparently hitherto undescribed species of *Ceratostomella* isolated from blue-stained timber in the U.S.S.R. *C. comata* n.sp. was isolated several times from pine logs near Moscow, on which it caused a grey stain of moderate intensity, with greenish-brown tinges. On beer wort agar the fungus produces a loose, white aerial mycelium tending to form small, vertical, coremial strands. Fructification sets in very early, at first by the production of conidia either on lateral branches of the strands or at the end of simple or more or less racemose hyphae. Typical *Graphium*-like coremia, up to 200 μ high, appear later, as the aerial mycelium becomes submerged in the substratum which takes on an intense brownish-black colour. The abundant, round to cylindrical conidia average 3 to 6·5 by 3 μ and accumulate at the top of the coremia in greenish-brown slimy droplets. Numerous perithecia were produced on sterilized wood. They are round to slightly elongated, 91 to 122 μ in diameter, with a beak 255 to 480 μ in length and 26 to 33 μ wide at the base, furnished at the tip with 14 to 24 cilia, 35 to 130 μ in length. The ascospores are kidney-shaped, and measure about 6 by 3·5 μ.

C. acoma n.sp. was also found exclusively on pine logs near Moscow, causing an intense bluish-black stain; it is considered to be locally one of the most active stainers of timber. On beer wort agar the fungus forms no aerial mycelium and grows slowly in the substratum, which eventually takes on a deep brown colour; at the end of two or three weeks, occasionally earlier, the submerged mycelium breaks up into numerous oidia, but no aerial fructification was seen. On wood the fungus produces within a week low, *Graphium*-like coremia, with a short,

cylindrical pedicel, frequently narrowing towards the base, which is occasionally of a faint brown colour. The conidia are cylindrical or obclavate, 2·5 to 5·7 by 2 to 3 μ in diameter, agglomerated at the top of the coremia in large white drops. Perithecia on wood are formed after three weeks; they are round, 200 to 250 μ in diameter, with a long (over 1 mm.), slender beak entirely devoid of cilia; the beak opens by simple dehiscence of its apical cells. The ascospores are cylindrical, and average 5·2 by 1·6 μ in diameter.

C. imperfecta n.sp. is an active stainer of pine and fir timber, and appears to be widespread in the U.S.S.R. On beer wort agar it forms a sparse, cottony, creeping aerial mycelium, at first pure white but in two to four days developing concentric greyish or brown rings; the substratum takes on a deep blackish-brown colour. The conidial fructification both on this medium and on wood is of the *Haplographium* type; the conidiophore (150 to 160 μ long) consists of a single, distinctly septate hypha which at its tip forms 2 or 3 rows of one-celled, closely adpressed, *Penicillium*-like branches, the end cells producing slender, hyaline sterigmata, from which the conidia are abstricted; the latter are white and slimy in mass, occasionally curved, and measure 5 to 13 by 3·2 to 5 μ. Perithecia are only formed on wood and are globular, 150 to 208 μ in diameter, with a stout beak measuring 312 to 520 by 39 to 45 μ and devoid of cilia. The oblong-oval ascospores are 5 to 5·5 by 2·6 to 2·8 μ in diameter. This fungus is considered to be related in its conidial stage to *H. bicolor* Grove. It causes an intense greyish-black discoloration of pine and fir wood, the parenchyma cells in the medullary rays of which are packed with its thick (up to over 10 μ in width) hyphae. The fungus frequently invades the tracheids chiefly of the spring wood; as in the other two species, the tracheids are penetrated exclusively through the bordered pits.

The paper terminates with German diagnoses of the three species described.

Dufrénoy (J.). **Le zinc et la croissance de la Vigne.** [Zinc and Vine growth.]—*La Potasse, 1934*, 75, pp. 137–139, 3 figs., 1934.

Very beneficial results in the development of vines (St. Emilion grafted on 1202 and Seibel hybrid 46–43) affected by court-noué in two localities in France were obtained by the application to the stocks in February of 500 gm. of zinc sulphate [cf. *R.A.M.*, xiv, p. 176] plus 500 gm. potassium sulphate.

Report on the work of the education and research division of the Ministry for the year 1932–1933. III. Horticulture.—*Journ. Min. Agric.*, xli, 9, pp. 863–891, 1934.

This paper summarizes the provisions of the Destructive Insects and Pests Order of 1933 and of the various orders issued during that year for the regulation of the growing or sale of plants affected with certain diseases in England and Wales as well as the importation of plants from abroad. It also contains an account of the practical application and working of these orders during the year under review.

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TCHERNTZOFF (I. A.). К вопросу о так называемой ,,скрытой" синеве хвойной древесины. [On the problem of the so-called 'latent' blue stain of coniferous timber.]—ex *Грибные повреждения древесины. Сборник работ Лаборатории Хранения Древесины ЦНИИМОД, I* [*Injuries to timber caused by fungi. Collection of the Works of the Laboratory for Timber Storage of ZNIIMOD, I*], pp. 129–142, Госуд. Лесное Техн. Издат. [State Forestal Tech. Publ. Office], Moscow, 1934.

Controlled experiments in 1933 [full details of which are given] with ten species of fungi causing blue stain in timber, including *Ceratostomella comata*, *C. acoma*, and *C. imperfecta* [*R.A.M.*, xiv, pp. 270, 271], showed that discoloration of the sapwood of coniferous trees does not immediately follow its invasion by these organisms, with the result that more or less wide zones of 'latent' infection are invariably present in affected material; these zones are always widest in a radial direction, in which the fungi spread most rapidly in the wood. The width of the latent zones was determined both by direct microscopical examination of artificially and naturally infected wood, and by plating out and incubating small shavings of the wood, taken at various distances from the visible boundary of the discoloration; both methods gave fairly consistent results, except with *C. coerulea* and *Trichosporium tingens* [ibid., ix, p. 77], for which the width determined by the second method was considerably greater than by the first.

The zone of latent infection extended much farther (on the average to a width of 3·5 and 5 mm. as determined by the two methods, respectively) in blocks of wood infected with the fungi on their tangential than on their radial surface (0·7 and 1·7 mm., respectively). The species of *Ceratostomella* developed, in general, a wider latent zone than the other species investigated, this being especially marked for *C. piceae* (up to 31 mm.), presumably owing to the weak and late development of pigment in the hyphae of this fungus.

While, with most of the fungi tested, the appearance of blue staining coincided with the darkening of the aerial mycelium, it was much later in *C. piceae*, and considerably earlier in *C. pini* and *T. tingens*; in timber infected with the two last-named species, internal blue stain may be present without any external symptom.

From a practical standpoint, these studies are considered to show that superficial chemical or mechanical treatment (planing) of sawn material is not a guarantee that blue stain may not develop in processed wood if it is subjected to conditions favouring the revival of the dormant infection.

MELIN (E.) & NANNFELDT (J. A.). **Researches into the blueing of ground wood-pulp.**—*Svenska Skogvårdsfören. Tidskr., 1934*, 3–4, pp. 397–616, 59 figs., 1 map, 1934. [Swedish summary.]

This is a very comprehensive and fully tabulated account of investigations (in progress since 1929) on the incidence, etiology, and control of fungal blueing of ground wood-pulp in Sweden [*R.A.M.*, ix, p. 76], the practical side of the work having been in the hands of the senior author while the junior writer undertook the taxonomic studies.

A consideration of the systematic affinities of the fungi commonly referred to the genus *Ceratostomella* has led to the transference of certain species to *Ophiostoma*, of which two new sections are distinguished, with Latin diagnoses, viz., *brevirostrata* Nannf., characterized by short, broad perithecial beaks and conidiophores of the *Cephalosporium* and *Cladosporium* types, and *longirostrata* Nannf., with long, conical or capilliform beaks and conidiophores resembling either those of *Chalara*, *Thielaviopsis* or (occasionally) *Graphium* or else similar to those of the first section. To the first section belong *O.* (*Ceratostomella*) *pini*, *O. minus* (*C. minor*), and *O. exiguum* (*C. exigua*). To the first group of the second section (endoconidia of the *Chalara* type) belong four species—*O.* (*Endoconidiophora*) *coerulescens*, *O. adiposum* (*C. adiposa*) [ibid., xii, p. 355], *O. fimbriatum* (*C. fimbriata*), and *O. paradoxum* (*C. paradoxa*) (all new combinations), while the second group (exogenous *Cephalosporium*- or *Cladosporium*-like conidia) comprises five species with known *Graphium* stages, viz., *O.* (*C.*) *piceae*, *O. canum* (*C. cana*) [ibid., viii, p. 345], *O.* (*C.*) *quercus* (Georgév.) Nannf. n.comb. [ibid., vii, p. 286], *O. merolinense* Nannf. n. comb. (*C. merolinensis* Georgév.) [ibid., x, p. 277], and *O.* (*C.*) *ulmi* (Buism.) Nannf. n.comb. [ibid., xi, p. 409], and ten of which the *Graphium* stage has not yet been recognized, including *O. coeruleum* (*C. coerulea*), *O. pluriannulatum* (*C. pluriannulata*) [ibid., xii, p. 669], *O. piliferum* (*C. pilifera sensu* Hedgc.), *O.* (*C.*) *fagi* Nannf. n.comb. [ibid., xii, p. 665], *O.* (*C.*) *castaneae* Nannf. n. comb. [ibid., xi, p. 681], *O.* (*C.*) *ips* (Nannf.) n.comb. [ibid., xiv, p. 68], and *O.* (*C.*) *stenoceras* Nannf. n.comb. [ibid., xii, p. 69]. The genus *Ceratostomella* proper (as exemplified by *C. vestita* and *C. cirrhosa*, but to which *C. pilifera* was wrongly referred by early writers) is not further discussed. It has already been pointed out that the part played by these and allied organisms in the blueing of timber and discoloration of wood-pulp is liable to exaggeration. During these investigations only the three species *O. coeruleum*, *O. piceae*, and *O. stenoceras* were encountered.

Discula pinicola [loc. cit.] was the only member of the five Sphaeropsideae isolated that calls for mention; it was obtained from the water in two of the mills inspected.

Seven species of *Cadophora* were investigated in connexion with the work, six of which are new and furnished with Latin diagnoses, namely, *C. americana* Nannf. n.sp. from wood-pulp in the United States (not

found in Sweden), *C. lagerbergii* Melin & Nannf. n.sp. from pine wood in Sweden, *C. melinii* Nannf. n.sp. from wood-pulp in Sweden, *C. obscura* Nannf. n.sp. from water in Sweden, and *C. richardsiae* Nannf. n.sp. from wood-pulp in the United States and Sweden. *C. fastigiata*, one of the commonest species, was repeatedly isolated not only from pulp but also from water and air. The other fungi concerned in the discoloration of pulp or present in the surrounding atmosphere or water were *Cladosporium* (*Hormodendrum*) *elatum* (Harz) Nannf. n.comb. [cf. ibid., xiv, p. 69], *C. herbarum*, *Haplographium penicillioides*, *Lecythophora lignicola* Nannf. [loc. cit.] (with Latin diagnoses of the genus and species), *Oidiodendron griseum* Robak n.sp. (Latin diagnosis), *O. fuscum*, *O. nigrum* [ibid., xii, p. 69], *Pullularia pullulans*, *Rhinocladiella atrovirens* Nannf. n.g. n.sp. (Latin diagnoses), in connexion with which is given a detailed discussion of the allied forms with 'radula spores' *sensu* E. W. Mason, some of these being regarded as probably imperfect stages of Basidiomycetes, and *Trichosporium heteromorphum* Nannf. n.sp. (Latin diagnosis) [ibid., xiv, p. 69], a widely distributed species in Sweden and occurring also in Norway and Finland.

Regarding the relative frequency of the species, *Cadophora fastigiata*, *L. lignicola*, *P. pullulans*, and *T. heteromorphum* were found in the majority of the seventeen mills investigated. The most important of the rarer blueing fungi were *C. melinii*, *C. obscura*, *C. richardsiae*, *Cladosporium herbarum* (which caused the most intensive greyish-blue to black staining on sterilized wood-pulp), *H. penicillioides*, and *R. atrovirens*. Up to 1,000,000 spores per gm. of dry wood-pulp were sometimes found. *Cadophora fastigiata* and *T. heteromorphum* caused dark greyish-green stains, often with a tint of blue, *P. pullulans* an intense stain of the same colour or turning to greyish-brown, while *L. lignicola* and some strains of *C. fastigiata* formed small greyish to greyish-green stains.

The factors governing the occurrence of blue stain are very fully considered with reference to the practical possibilities of control, among which may be mentioned the introduction into the grinding water either of cultures of certain yeast-like organisms with a known inhibitory effect on the fungi under discussion, e.g., *Geotrichum candidum* [ibid., ix, p. 201] and species of *Blastodendrion*, *Geotrichoides*, *Mycotoruloides*, *Torulopsis*, and *Sporotrichum*, or of chemical preservatives, such as sulphuric acid, paranitrophenol, H146 neu, and sodium chloride.

A six-page bibliography is appended.

NISIKADO (Y.) & YAMAUTI (Y.). **Contributions to the knowledge of the sap stains of wood in Japan. II. Studies on Ceratostomella pini Münch, the cause of a blue stain of Pine trees.**—*Ber. Ōhara Inst. Landw. Forsch.*, vi, 3, pp. 467–490, 5 pl., 1934.

Continuing their studies on the sap stains of wood in Japan [*R.A.M.*, xii, p. 606], the writers fully describe and tabulate the results of their morphological and physiological investigations on *Ceratostomella pini* [see preceding abstracts], commonly found on *Pinus densiflora* and *P. thunbergii*.

The fungus (which is strictly aerobic) attacks not only felled timber but standing trees weakened by bark beetles or other agencies. As in

C. ips, the hyphae penetrate the parenchymatous cells of the medullary rays from the cortex towards the centre, growing longitudinally through the resin ducts and tracheids and tangentially through the bordered pits. In morphological characters the Japanese material of *C. pini* was found to agree well with Münch's description. On standard culture media at 25° C. its growth was much more profuse than that of *C. ips* and *C. piceae*. The conidia of *C. pini* were killed by 15 and 5 minutes' immersion, respectively, in water at 52° and 54° and by one hour in 1 in 6,000 mercuric chloride or 1 in 200 formalin; growth of the fungus was retarded in 1 per cent. malt extract solution by the addition of 1 in 100,000 mercuric chloride and 1 in 10,000 iron sulphate or uspulun.

WATERMAN (R. E.), KOCH (F. C.), & MCMAHON (W.). **Chemical studies of wood preservation. III. Analysis of preserved timber.**—*Indus. & Engin. Chem.*, Analyt. Ed., vi, 6, pp. 409–413, 4 figs., 1 diag., 1934.

Full technical details are given of the analytical methods devised at the Bell Telephone Laboratories, New York, for the examination of timber, treated either by creosoting or with inorganic salts [cf. *R.A.M.*, xiv, p. 139] for the prevention of decay. These methods are adapted, on the one hand, to the appraisal of freshly treated poles for quantity and extent of distribution of the preservative and, on the other, to determining the extent of depletion during years of exposure. The manner of recovery of creosote from old timber and methods for the analysis and toximetry of this substance (calculated mainly in reference to *Fomes annosus*, *Lentinus lepideus*, *Poria incrassata*, and *Coniophora cerebella* [*C. puteana*] on the lines laid down at the Forest Products Research Laboratory, Madison, Wisconsin) [ibid., iv, p. 579] are described.

WATERMAN (R. E.) & WILLIAMS (R. R.). **Chemical studies of wood preservation. IV. Small sapling method of evaluating wood preservatives.**—*Indus. & Engin. Chem.*, Analyt. Ed., vi, 6, pp. 413–418, 2 figs., 6 diags., 1934.

In order to expedite tests of the permanency of telephone-pole preservatives [see preceding abstract], use is made of groups of small southern yellow pine [*Pinus palustris*] saplings treated with the substance to be judged and set in the ground as miniature poles. In such specimens weathering is relatively rapid by reason of the large ratio of surface to volume, and poorly preserved material begins to decay after a year or two. Periodical analyses, toxicity tests, and observations on decay are made. Seven years' experience indicates that the comparative preservative values of various salts, creosotes, oils, and the like may be estimated fairly cheaply, quickly, and with considerable reliability by this method.

REINMUTH (E.). **Beiträge zur Frage der Gemüsesamenbeizung und zur laboratoriumsmässigen Prüfung der Beizmittelwirkung bei Gemüsesamen.** [Contributions to the question of vegetable seed disinfection and the laboratory testing of the action of disinfectants on vegetable seeds.]—*Angew. Bot.*, xvi, 6, pp. 441–504, 15 graphs,1934.

Following a general account of the theoretical and practical aspects of vegetable seed disinfection against a number of diseases known to be

perpetuated by the seed [cf *R.A.M.*, xiii, p. 740; xiv, p. 48], and of the methods employed in the routine laboratory testing of the various preparations such as germisan, uspulun, ceresan, and formaldehyde liquids and abavit B, tillantin R, ceresan, and tutan dusts, commonly used for this purpose, the writer fully discusses and tabulates the results of his experiments at the Rostock Agricultural Experiment Station in the seed disinfection of red and white cabbage and kohlrabi, celery, tomato, onion, leek, and lettuce.

At the normal germination temperature of 20° C. the cabbage seed did not prove unduly susceptible to the action of the standard disinfectants used; at 30° germinative capacity was impaired except in the case of formaldehyde. Kohlrabi was more liable to be adversely affected by the treatments at high concentrations. Ceresan and uspulun (liquid) were practically non-injurious to celery, even at high strengths. Tomato seed was found to be extremely sensitive to the action of liquid disinfectants, germisan being the sole mercury-containing preparation that proved to be suitable for this purpose and then only at a moderate temperature. Dusts were less detrimental. Both onions and leeks responded satisfactorily to disinfection even at raised concentrations. In order to secure uniform moistening of lettuce seed with the liquid preparations it was found advisable to immerse it beforehand for 30 minutes in a 1 per cent. soft soap solution. The therapeutic efficacy of the various preparations was calculated by means of a modification of E. G. Pringsheim's method involving the addition of 2 per cent. agar to the sugar bouillon solution used for germination [ibid., vii, p. 733].

BREJNEFF (I. E.). Влияние вносимых в почву удобрений на развитие болезней Капусты. [Effect of applications of soil fertilizers on the development of Cabbage diseases.]—*Труды Ленинградск. Общ. Естествоиспытателей.* [*Trav. Soc. Nat. St-Pétersb.* (*Leningr.*)], lxiii, 1, pp. 83–109, 4 graphs, [1934. French summary.]

A detailed account is given of experiments in wooden boxes carried out to test the possibility of controlling club root (*Plasmodiophora brassicae*) and downy mildew (*Peronospora brassicae*) [*P. parasitica*: *R.A.M.*, xii, p. 546] of cabbage by applications to the soil of various mineral fertilizers, ranging from chemically or physiologically acid to alkaline substances, and stable manure alone or mixed with lime. The results indicated that nitrogen with or without phosphorus promoted a luxuriant growth of the cabbage seedlings, but also favoured the development of club root to an extent which more than counterbalanced its beneficial action on vegetative vigour. While all the acid fertilizers were favourable to the development of the disease, the neutral or alkaline ones considerably reduced or even completely controlled it, but in most cases had a markedly depressing effect on the growth of the host. It is believed, however, that a good measure of control may be obtained by applying to the soil certain mineral salts, e.g., potassium, calcium, and sodium nitrates, which are both beneficial to the plant and have a controlling effect on the club root organism. Under the conditions tested, the Valvatievka variety was markedly more resistant to club root than the Brunswick cabbage.

On the other hand, none of the fertilizers tried had any very marked effect on the development of downy mildew. On general lines, these studies are considered to suggest that mineral fertilizers may be useful in controlling diseases affecting the underground parts, but to a much lesser degree those of the aerial organs of plants, where the parasite is not in direct contact with the substances employed.

GIBBS (J. G.). **Club-root control. Further experiments on the control of club-root in Cabbage seed-beds.**—*New Zealand Journ. of Sci. & Tech.*, xvi, 3, pp. 159–162, 1934.

The results [which are tabulated and briefly discussed] of experiments during 1932–4 on the comparative value of 39 disinfectant treatments against club root [*Plasmodiophora brassicae*] of Succession cabbage and Broad Leaf Essex rape in seed-beds at Palmerston North, New Zealand, indicated that the cheapest and most reliable fungicide is 0·1 per cent. acidulated mercuric chloride solution at 2 galls. per sq. yd. [*R.A.M.*, xii, p. 412]. The cost of the treatment in 1933–4 was estimated at under $2\frac{1}{2}$*d.* per sq. yd. Mercurous chloride at the same strength also gave good control of *P. brassicae* but caused yellowing and stunting of the seedlings. Slight infection (3·25 per cent.) occurred at soil depths exceeding 3 in. even in the plots treated with mercuric chloride, which completely sterilized the upper layers.

GUTZEVITCH (S. A.). Заболевание Капусты „черная ножка", **Moniliopsis aderholdi Ruhl.** ['Black leg' disease of the Cabbage, *Moniliopsis aderholdi* Ruhl.]—*Труды Ленинградск. Общ. Естествоиспытателей* [*Trav. Soc. Nat. St-Pétersb.* (*Leningr.*)], lxiii, 1, pp. 69–82, 2 figs., [1934. English summary.]

The author's investigations at Detskoye Selo in 1931 showed that the 'black leg' disease of cabbages, which is very prevalent and causes important losses practically over the whole of the U.S.S.R., though hitherto usually attributed to *Olpidium brassicae* [*R.A.M.*, vii, p. 202], is in reality caused, at least in the region of Leningrad, by the fungus commonly known as *Moniliopsis aderholdi* [cf. ibid., x, p. 416]. Morphological and biological studies [some details of which are given] and a review of the relevant literature, however, lead him to the conclusion that the fungus should be referred to the genus *Rhizoctonia* [cf. ibid., v, p. 193], with which the whole genus *Moniliopsis* should be reunited as it is based on insufficiently distinctive characteristics [cf. ibid., xiii, p. 598].

In pure culture the fungus was shown to be highly resistant to the action of environmental conditions, as it readily withstood a temperature of $-18°$ C. for several weeks and drying out at room temperature for $2\frac{1}{2}$ years; it grew at hydrogen-ion concentrations ranging from P_H 4·94 to 9·18 with a somewhat indistinct optimum between 7 and 7·6. It developed and attacked cabbage seedlings equally well at all the soil moistures tested between 40 and 100 per cent., and it exhibited high tolerance to the action of comparatively large doses of iron sulphate, potassium bichromate, calcium chloride, sulphuric acid, bromine, formalin, and sulphur dust applied as soil disinfectants.

MACDONALD (J. A.). **The life history and cultural characteristics of Typhula gyrans (Batsch) Fries.**—*Ann. of Appl. Biol.*, xxi, 4, pp. 590–613, 3 pl., 34 figs., 1934.

After a brief review of the history of *Typhula gyrans* [*R.A.M.*, vii, p. 701] and of its previous records on various host plants [41 references to which are cited], the author gives full details of his investigations of its life history and pathogenicity in Scotland to swedes and turnips at all stages of development under various conditions. The fact that all attempts to secure infection with it failed, and that in one field experiment nearby rows of cabbage and Brussels sprouts also remained unaffected, is considered to demonstrate that in Scotland the fungus is in all probability only a saprophyte.

The cultural study of *T. gyrans* showed that it is heterothallic, since monospore strains failed to produce clamp connexions, sclerotia, or sporophores when grown alone, but when paired, mixing and fusion of the hyphae occurred in some cases and resulted in the formation of these organs.

HARTER (L. L.), ZAUMEYER (W. J.), & WADE (B. L.). **Pea diseases and their control.**—*U.S. Dept. of Agric. Farmers' Bull.* 1735, 24 pp., 12 figs., 2 maps, 1934.

Popular notes are given on the symptoms, etiology, and control of the principal pea diseases in the United States.

PETHYBRIDGE (G. H.). **Marsh spot in Pea seeds.**—*Journ. Min. Agric.*, xli, 9, pp. 833–849, 4 pl., 1934.

From a brief survey of the literature up to date on the marsh spot disease of peas in England and abroad [*R.A.M.*, xiii, p. 205], supported by some observations and tests made at the Plant Pathological Laboratory, Harpenden, since 1926, the author concludes that the condition is a defect of the pea seed, characterized by the death of larger or smaller portions of the tissues of inner (flat) face of the cotyledons, sometimes involving the plumule, and arising from certain unfavourable soil conditions which are not yet clearly understood. Tests at Harpenden indicated that the effect of the disease on the percentage germination of affected seeds is practically negligible, except in rare cases when the lesions are particularly large. The fact, however, that seedlings grown from marsh-spotted seeds are usually defective from the outset to a greater or lesser degree, may be of practical importance under unfavourable environmental conditions, not allowing of a rapid recovery of the plants from the initial handicap. The exact time at which the cotyledonary lesions begin to appear in the developing peas has not yet been determined with certainty, but there is some evidence that they are not present in the very young seed and become most pronounced during the later stages of ripening. The experiments do not indicate that the tendency to the development of marsh spot is hereditary.

LACEY (MARGARET S.). **Studies in bacteriosis. XXI. An investigation of marsh spots of Peas.**—*Ann. of Appl. Biol.*, xxi, 4, pp. 621–640, 1 pl., 1934.

A detailed account is given of the author's investigation of the 'marsh

spot' disease of peas in England [see preceding abstract], which confirmed Helena de Bruijn's conclusion in Holland that the trouble is not caused either by fungi or bacteria [*R.A.M.*, xiii, p. 204]. Of 200 dried and 200 green pea seeds showing lesions of the disease on the cotyledons that were tested bacteriologically, only 40 per cent. of the former and 20 per cent. of the latter yielded growths of microorganisms, of which the two predominating species were a sporing bacillus of the *Bacillus subtilis* or *B. mesentericus* type and a minute yellow rod, probably *B.* [*Bacterium*] *herbicola aureum* [ibid., xii, p. 98], both of which were also frequently found on the outside of pea seeds and in a few cases in the centre of the cotyledons of healthy peas. Numerous attempts to reproduce the condition by inoculation of young pea seedlings and also of pods in various stages of development with cultures of all the organisms that were isolated from diseased material gave negative results.

Germination tests of marsh spot seeds showed that badly affected peas failed to develop; in less severe cases the primary shoot frequently died soon after germination, further growth being continued by the development of lateral shoots. In most seasons, after the seedling stage, no difference could be observed between plants grown from diseased or healthy seeds, and there was no evidence of any increase in the incidence of the trouble in the progeny from the diseased lot. While attempts to determine the effect of soil and excessive watering on the development of marsh spot in pot cultures gave entirely negative results, there was clear evidence that the conditions in pot culture are not suitable for the production of the trouble.

The paper terminates with a note by Dr. B. J. Grieve on the results of his microscopical investigation of the lesions caused by the disease in peas. The most noticeable point is the absence of any wound reaction around the lesion, the walls of the necrosed cells of which, however, showed the presence of suberin and insoluble pectic compounds.

LATHAM (D. H.). **Life history of a Cercospora leaf-spot fungus of Cowpea.** —*Mycologia*, xxvi, 6, pp. 516–527, 1 pl., 2 figs., 1934.

Since 1931 the writer has been engaged on a study of *Cercospora cruenta* [*R.A.M.*, xiv, p. 87], the agent of a leaf and stem spot of cowpea in North Carolina and other parts of the United States. Other hosts of the fungus represented in the Bureau of Plant Industry Herbarium include *Calopogonium* sp., *Dolichos sesquipedalis*, *D. sinensis*, *Phaseolus aureus*, *P. vulgaris*, *Vigna catjang*, and *V. unguiculata*.

The foliar lesions are reddish-brown, up to 1 cm. or more in diameter, becoming necrotic, sometimes coalescing, and turning grey to black on the under side with the formation of conidiophores and conidia. The hyphae are at first intercellular and form haustoria, but later on may become intracellular. They form a loosely interwoven, intercellular stroma in the substomatal cavities and elsewhere, from which arise erect, pale olive, loosely fasciculate, simple, forked, or subdenticulate conidiophores bearing acicular-obclavate, slightly curved, hyaline to olive conidia, tapering towards the apex and measuring 35 to 154 by 3·5 to 4·5 μ (average 62·5 by 3·7 μ), the average number of septa being five. These dimensions agree closely with those given by Saccardo for

C. cruenta. Late in September spermogonia develop within the subepidermal stromata; they measure 31 to 77 by 24 to 70 μ and contain hyaline, rod-shaped spermatia, 2 to 2·5 by 0·8 μ, all attempts at the germination of which failed. Perithecia were formed from old, subepidermal stromata from January onwards. They are scattered or with a tendency to aggregation, amphigenous (mostly hypophyllous), innate but erumpent at maturity, globose, black, ostiolate with an ill-defined papilla, and measure 52 to 70 by 63 to 87 μ; the fasciculate, cylindrical-clavate, aparaphysate asci measure 35 to 52 by 7 to 11 μ and contain eight unequally bi-cellular (the upper cell somewhat the larger), very slightly curved, hyaline ascospores, 11 to 19·2 by 3·5 μ (mostly 14 to 17·5 by 3·5 μ).

In pure culture on potato-dextrose agar conidia formed only during the first five days whether the cultures were derived from conidia or ascospores. Inoculations with ascosporal suspensions gave lesions bearing conidia identical with those produced by conidial suspensions. The perfect stage is a *Mycosphaerella* which is named *M. cruenta* n.sp., with English and Latin diagnoses.

Jiromskaya (Mme E. N.). Активность плесневых грибов в заболевании корнеедом ростков Сахарной Свеклы. [Activity of mould fungi in the etiology of the root disease of Sugar Beet seedlings.]—*Научные Записки по Сахарной Промышленности.* [*Sugar Industry Scient. Notes*], Kieff, xxxvii–xxxviii (10th year publ.) [Red Ser.], 11–12, pp. 199–206, 1934.

The results of the controlled experiments reported in this paper, carried out in 1930 in the neighbourhood of Kieff and at the Bielaya Tzerkoff [Ukraine] Agricultural Experiment Station, again showed that *Phoma betae* plays a very important part locally in causing root rot of sugar beet seedlings [*R.A.M.*, ix, p. 696]. It is particularly pathogenic during the earliest stages of development of the seedlings, many of which perish before the formation of the first pair of true leaves; it is believed that the fungus is also responsible for the death of a fairly large percentage of the germinating seed before emergence [cf. ibid., xiii, p. 742]. The experiments further confirmed the previously reported observation that the incidence of foot rot was markedly reduced in seedlings raised from seed inoculated with pure cultures of *Torula convoluta* as compared with the controls, even though the differences were not statistically significant in every case, and the cause of this reduction has yet to be elucidated. Inoculation of the seed clusters with dark moulds (e.g., *Alternaria tenuis* and *Cladosporium herbarum*) increased the incidence of foot rot from the end of April to the end of June; the disease caused by these moulds, however, was not as severe during the early stages as that caused by *P. betae*, and many of the plants attacked eventually recovered. Preliminary field observations showed, finally, that in volunteer beet seedlings grown from seed that had been produced by beets the roots of which were infected with *P. betae*, the percentage of foot root was more than twice that in controls, suggesting a direct relationship between infection of the roots and that of the seed produced by the diseased beets.

FRON (G.). **Observations sur l'influence de la pluviosité sur le développement de la maladie du cœur de la Betterave.** [Observations on the influence of precipitation on the development of Beetroot heart rot.]—*Comptes rendus Acad. d'Agric. de France*, xx, 27, pp. 883–888, 1934.

Notwithstanding the abnormally low mean rainfall in France during the past three winters, culminating in the drought of 1934, the current beet yields in certain districts, e.g., the Soissonnais and the plain of Lieusaint, are stated to have been very satisfactory, whereas in others, notably the environs of Meaux and Étampes and in the north of the Department of Loiret, heart rot (associated with *Phoma* [*betae*: *Mycosphaerella*] *tabifica*) [*R.A.M.*, xii, p. 549; see also xiv, p. 141 and preceding abstract] has caused heavy losses. In the writer's opinion the presence or absence of this disease is dictated primarily by the water-holding capacity of the soil. The fertile alluvial soils of the above-mentioned plains still maintained adequate reserves of moisture at a depth of 1 to 1·6 m. at the end (in September) of the protracted drought. The poor yields, on the other hand, came from the so-called 'white soils', i.e., those that had become desiccated through the removal by successive erosions of the upper layer of mud, leaving a sandy, often calcareous surface.

Further confirmation of the influence of desiccation on the development of heart rot was obtained at a farm near Meaux. On one part of a field in which the beet crop was sown in April the disease occurred in a virulent form, while the other section remained healthy. The latter had borne peas in 1933, but on account of poor growth the stand was early removed and the soil worked for fallow; the diseased part had been under a very vigorously growing clover crop which had completely exhausted the moisture reserves.

FOËX (E.) & BURGEVIN (H.). **Observations sur la maladie du cœur de la Betterave.** [Observations on the heart rot of the Beetroot.]—*Comptes rendus Acad. d'Agric. de France*, xx, 29, pp. 978–982, 1934.

The summer and autumn of 1933 witnessed a very marked recrudescence of heart rot of beets, especially in the vicinity of Montargis, in Sologne, Brie, Seine-Inférieure, and Mayenne, while in the following year (also very dry) the phenomenon was even more pronounced [cf. preceding abstract]. In certain parts of Valois the losses in the sugar-beet stands are estimated at Fr. 1,500 per hect.

Nearly all the soils in the affected localities were found to be strongly alkaline (P_H 8 to 8·5), and in this connexion attention is drawn to the risk of over-liming where heart rot is to be feared. Good results in the control of the disease were obtained in one field by seed treatment with formol, a fact suggesting that *Phoma betae* plays a certain part, though no doubt a secondary one, in the causation of the disease. In two fields in the Loiret the therapeutic action of boric acid at 3 to 6 kg. per hect. was conclusively demonstrated; sodium borate at the rate of 10 kg. per hect. may also be used. A combination of seed and soil treatments on these lines gave excellent results.

JAGGER (I. C.) & CHANDLER (N.). **Big vein, a disease of Lettuce.**—*Phytopath.*, xxiv, 11, pp. 1253–1256, 1 fig., 1934.

Along with lettuce plants showing the typical symptoms of brown blight [*R.A.M.*, v, p. 598; viii, p. 286] in California, some are occasionally found with conspicuous pale yellow, enlarged veins and general thickening and crinkling of the leaves. These symptoms are most pronounced in actively growing plants, becoming noticeable with the fifth or sixth leaf and tending to disappear towards maturity. The disorder, known as 'big vein', is usually most severe in winter lettuce, the heads being reduced to about half the normal size and of inferior quality and value. Since it was first observed in connexion with brown blight about 1922, 'big vein' has slowly increased and during the past few years lettuce cultivation over a limited area has had to be discontinued owing to the severity of the disease, which has recently been detected also in Arizona. So far, however, there is no question of any serious interference with the commercial production of the crop as a result of 'big vein', which appears to be largely confined to the heavier types of poorly drained soils. The disease is soil-borne and may be controlled by partial sterilization of the ground. There is some indication, though no direct evidence, that the agent of 'big vein' may be a virus similar to that responsible for wheat mosaic [ibid., v, p. 85]. Though bearing a general similarity to brown blight, it is considerably less virulent and does not spread so rapidly.

KENDRICK (J. B.) & SCHROEDER (F. R.). **Inoculation tests with Verticillium wilt of Muskmelons.**—*Phytopath.*, xxiv, 11, pp. 1250–1252, 1934.

Verticillium albo-atrum caused a destructive wilt of Persian muskmelons in San Joaquin County, California, in 1932 [cf. *R.A.M.*, iv, pp. 323, 495]. The diseased plants showed a brown discoloration of the vascular tissues of the root, stem, and large lateral shoots; the crown leaves wilted just before harvest and shortly afterwards the whole plant collapsed. The fungus did not attack the Hale's Best and Honey Dew varieties in the same field, but in greenhouse inoculation tests both proved susceptible, as also did Casaba and (to a considerably lesser degree) Honey Ball.

KADOW (K. J.). **Seed transmission of Verticillium wilt of Eggplants and Tomatoes.**—*Phytopath.*, xxiv, 11, pp. 1265–1268, 1 fig., 1934.

Details are given of tests at the Illinois Agricultural Experiment Station to ascertain the possibility of wilt (*Verticillium albo-atrum* or *V. dahliae*) transmission in eggplant [*R.A.M.*, xiii, p. 350; xiv, p. 74] and tomato [ibid., x, p. 757 *et passim*] by means of the seed. Infection was found to be conveyed in this manner, internal infection being of considerably more importance than external and perhaps accounting for the apparent coexistence of the disease with eggplant cultivation in the State. Some indication was obtained that eggplant seeds may be freed from *Verticillium* infection by 20 minutes' immersion in hot water at 120° F., but the selection of clean seed is the most important control measure.

WATANABE (T.) & TAKAHASHI (N.). **A new leaf-spot disease of Arctium lappa L. caused by Cercosporina lappae n.sp.**—*Bull. Utsunomiya Agric. Coll.*, i, 1, pp. 33–40, 1 pl., 1934. [Japanese, with English summary.]

A Latin diagnosis is given of *Cercosporina lappae* Wat. & Tak. n.sp., the agent of a leaf spot of *Arctium lappa* [cultivated in Japan as a root vegetable].

The brown to blackish-brown, sharply defined, angular lesions, 1 to 8 mm. in diameter, are sprinkled in the centre or near the margin with small, greyish-white points formed by the fructifications of the fungus; the subhyaline to hyaline hyphae are 2·5 to 4·4 μ in width and the amphigenous, caespitose, straight or subflexuose, 0- to 8-septate conidiophores, pale yellow at the apex and brown at the base, measure 27·5 to 242·5 by 2·5 μ; the humeriform conidial scars are prominent, and the hyaline, 1- to 19-septate, cylindrical or acicular-obclavate, straight or flexuose conidia measure 27·5 to 270 by 2·5 to 6·25 μ.

Inoculation experiments with conidia produced on apricot decoction agar and on naturally infected foliage gave positive results on *A. lappa* leaves after an incubation of seven to ten days. At Utsunomiya the disease reached a climax between the end of August and late September. Promising results were given by weekly applications of 0·8 per cent. Bordeaux mixture from a month after the emergence of the seedlings onwards.

Edible and poisonous fungi.—*Min. of Agric. and Fish. Bull.* 23, v+25 pp., 24 col. pl., 1934.

This well-produced and useful little book, issued by the Ministry of Agriculture to assist in the identification of some of the more common edible and poisonous fungi, is a revised version of one originally prepared by G. Massee in 1910, with the whole of the text and nomenclature brought up to date. Illustrated by 24 excellent coloured plates (notably 15 new ones from paintings by Miss E. M. Wakefield who is also responsible for the revision of the text), the book gives short popular descriptions of 15 edible and 9 poisonous varieties of fungi, of which 20 belong to the Agaricaceae, the others being *Craterellus cornucopioides*, *Lycoperdon giganteum*, *Boletus edulis*, and *Morchella esculenta*. There are brief notes on the preparation of the edible kinds for the table, and the type of locality and the season in which the fungi may be found are indicated. A glossary of the few technical terms used is appended.

ZELLER (S. M.) & TOGASHI (K.). **The American and Japanese Matsu-takes.**—*Mycologia*, xxvi, 6, pp. 544–558, 6 figs., 1934.

Japanese residents of the Pacific borders of Oregon and Washington have applied the same name, 'matsu-takes' (pine mushrooms) to an American species of *Armillaria* as is given to that occurring in Japan, both being extensively used by them. However, from the writers' investigations [the results of which are fully discussed and the biometrical data tabulated] it would appear that the differences between the two are sufficient to warrant specific separation. The Japanese species, *A. matsutake* Ito & Imai (*Bot. Mag.*, Tokyo, xxxix, p. 327, 1925) is predominantly associated in a mycorrhizal relationship with

Pinus densiflora, while the American species *A. ponderosa* (Peck) Sacc. is found at its best in connexion with *P. contorta*. *A. ponderosa* is paler (pinkish-buff or light ochraceous salmon) than *A. matsutake* (tawny, russet, or Mars brown), the surface of the latter, moreover, being fibrous and scaly in contrast to the smooth, subviscid texture of the former.

Börner (C.) & Schilder (F. A.). **Beiträge zur Züchtung reblaus- und mehltaufester Reben.** [Contributions to the breeding of *Phylloxera*- and mildew-immune Vines.]—*Mitt. Biol. Reichsanst. für Land- und Forstw.*, 49, 84 pp., 4 pl., 1934.

In the introductory section of this paper the first-named author defines and discusses the conditions to be observed in the German programme for vine breeding for combined immunity from *Phylloxera vastatrix* and downy mildew (*Plasmopara*) [*viticola*: *R.A.M.*, xii, p. 548] in stocks and hybrids, while the second part (by both authors) deals with the reaction to *Phylloxera vastatrix* of selected vines of the Naumburg collection.

Husfeld (B.) & Scherz (W.). **Neuaufbau der Rebenunterlagenzüchtung.** [Reorganization of Vine stock breeding.]—*Der Züchter*, vi, 11–12, pp. 280–288, 9 figs., 1934.

Discussing the requirements for vine stocks under German conditions, the writers emphasize the necessity of a sufficient degree of resistance, not only to *Phylloxera vastatrix* and *Plasmopara viticola* [see preceding abstract], but also to *Uncinula necator* and *Pseudopeziza tracheiphila*. In inoculation experiments at the Kaiser Wilhelm Plant Breeding Institute, Müncheberg, Mark Brandenburg, resistance or only slight susceptibility to *U. necator* was shown by (I) the following American vines and their hybrids: Riparia G (11 numbers), Colorado, Gloire de Montpellier, grand glabre, pubescens bleu, splendens, Trier, Solonis, Solonis Trier, Rupestris G (4 numbers), du Lot, St. Georg, Tiefenbach, Riparia × Rupestris G (4 numbers), and M.G. 101^{10}, 101^{16}, 101^{14}, 108^{16}, and 108–103. (II) American × European (F_1) crosses: Riparia × Gamay 604 Oberlin, Gamay × Riparia 702 Oberlin, 716 Oberlin, falsche Gamay × Riparia 714 Oberlin, Riesling × Riparia 57 and 194 G, Trollinger × Riparia G (6 numbers), Aramon × Riparia 143 B.M.G., Aramon × Rupestris 1 Ganzin, and Solonis × Gutedel G (3 numbers). More or less marked susceptibility, on the other hand, was shown by the following representatives of group (I): Riparia I G Engers, 1 G, 88 G, *Vitis labrusca*, Rupestris 9 HG., 186 G, Riparia × Rupestris G (6 numbers), Cordifolia × Rupestris 89 G, Rupestris × Cinerea × Riparia 239–6–20 M.G., and Rupestris × Cinerea de Grasset (Mill.). (II) Riparia × Gamay 605 Oberlin, Riparia × Trollinger 37 and 56 G, Trollinger × Riparia 26 G, Frühburgunder × Cordifolia × Rupestris 17 G. (III) All varieties of *V. vinifera* [cf. *R.A.M.*, viii, p. 700 *et passim*].

The experimental results obtained with *P. tracheiphila* will form the subject of a separate publication.

Labrousse (F.). **Quelques observations sur les maladies des plantes en 1933.** [Observations on plant diseases in 1933.]—*Rev. Path. vég.*, xxi, 2–3, pp. 3–8, 1934.

These notes on diseases of market-garden crops, beetroots, and

tobacco observed during 1933 in the vicinity of Paris [cf. *R.A.M.*, xiv, p. 77] contain, among others, the following items of phytopathological interest. The resistance to bean [*Phaseolus vulgaris*] grease spot (*Bacterium medicaginis* var. *phaseolicola*) shown by the Nain abundant variety in 1931 [ibid., xi, p. 344] was confirmed, while the Nain de Chenilly variety proved practically immune from mosaic. Peas affected by collar rot were found to yield *Aphanomyces euteiches* unaccompanied by *Thielaviopsis basicola* [cf. ibid., xiii, p. 76]; early sowings, even when severely affected, gave a normal crop.

Su (M. T.). **Report of the Mycologist, Burma, Mandalay, for the year ending the 31st March, 1934.**—*Rep. Dep. Agric. Burma, 1933–4*, pp. 25–33, 1934.

A stunting of rice observed at the College Farm in 1932 and 1933 was found to be due to adverse soil conditions which were ameliorated in the Agricultural Chemist's experiments [pp. 14–15] by applications of sulphur in the form of sulphuric acid, sulphates, or superphosphate.

Sorghum was extensively attacked by *Colletotrichum lineola* [*C. graminicolum*: *R.A.M.*, v. p. 656], infection by which appears to take place both from the soil and aerially. A similar leaf spot was caused by *Cercospora sorghi* [ibid., xii, p. 395]. Wheat and barley were both infected by *Helminthosporium sativum* [ibid., xiv, p. 80 and below, p. 299].

Practically complete control of mildew (*Oidium*) on betel [*Piper betle*] leaves [ibid., xiii, p. 682] was given by treatment with sulphur dust.

The bulk of mangosteen (*Garcinia mangostana*) decay in storage was found to be due to *Diplodia natalensis* [ibid., xiii, p. 78]. The same fungus was found in some 8 per cent. of the mango fruits kept over in storage from a trial shipment to England, but most of the damage (73 per cent.) was associated with a *Dothiorella* [cf. ibid., x, p. 340]. Both these fungi were found to enter the fruits through the stem end.

Alternaria circinans [*A. oleracea*: ibid., xiii, p. 21] caused severe damping-off and dark spotting of the leaves in cabbage and cauliflower seedlings at the College Farm.

A papaw disease, causing foliar crinkling and distortion and apparently of virus origin, was greatly in evidence in many parts of the country, reducing the yield in severe cases.

C. traversiana was observed, for the first time in Burma, on *Trigonella foenum-graecum*.

The edible straw mushroom (*Volvaria* sp.) was successfully cultivated [ibid., xiii, p. 420], pure culture spawn being prepared in the laboratory and used for inoculating the beds.

Forty-fourth Annual Report Washington Department of Agriculture for the fiscal year ended June 30, 1934.—*Bull. Wash. St. Agric. Exp. Sta.* 305, 78 pp., 1934.

In the section of this report dealing with agronomy (pp. 13–25) it is stated that in a study by E. F. Gaines and A. M. Schlehuber of the inheritance of resistance to two biotypes of wheat bunt [*Tilletia caries*] made on an F_3 family of White Odessa × Turkey-Florence winter wheat (White Odessa being very susceptible to form t–4 [*R.A.M.*, xii, p. 618]

bunt but resistant to that from Ridit wheat, while with Turkey-Florence the reverse obtains) the full reaction of the parents was not manifested in any of 117 F_3 families inoculated with Ft–4, but some of the F_3 segregates when inoculated with *T. caries* from Ridit showed transgressive segregation. In general, when the F_3 segregates were inoculated with a mixture of both forms, the susceptible types produced less smut and the resistant ones more than when they were inoculated with a pure culture of the biotypes concerned. Ft–4 causes dwarfing of the florets, often accompanied by empty glumes, in Turkey-Florence and Ridit.

Of 64 families from Ridit × Hybrid 128 and Oro × Hybrid 128 inoculated with a mixture of 20 bunt biotypes, 5 remained free from infection and 7 others showed under 1 per cent. The progeny of a cross of Turkey (Wash. 2546) with Turkey-Florence consisting of 50 rows produced 8 rows entirely free from bunted heads and many others with only a trace; Turkey × Albit gave 2 bunt-free rows in the F_3, Turkey × Hohenheimer 11, while 52 F_3 families of Turkey-Florence × Baart-Ridit also showed many practically immune segregates.

In some 400 varieties and hybrid selections from F_3, F_4, and older generations of spring wheat the same general results were obtained as with the winter varieties. Crosses of Federation and Ridit, Turkey-Florence and Baart-Ridit, Turkey-Florence and Marquis-Florence, Marquis-Florence and Federation, Baart-Ridit and Federation, and Hope and White Odessa all produced practically immune or highly resistant segregates, from which it is hoped that some commercially desirable spring variety may be produced that shall be immune from all 20 biotypes of bunt.

In the section dealing with plant pathology (pp. 47–51) it is stated that in further studies by F. D. Heald, E. F. Gaines, and C. S. Holton [ibid., xiii, p. 359] 11 physiologic forms of *T. caries* and 10 of *T. levis* [*T. foetens*] have now been recognized. A new dust, basic copper sulphate, gave a degree of bunt control equal to that given by copper carbonate or ceresan and did not injure the seed. Smutted plants were more liable than healthy ones to be killed by frost.

A survey of the amount of decay among apples in cold storage in the Wenatchee district by G. A. Newton and in the Yakima Valley by P. Allen showed that blue mould [*Penicillium expansum*: loc. cit.] was the chief cause of decay in both localities. Grey mould (*Botrytis cinerea*) was exceptionally prevalent in the Wenatchee district, where much rain fell during harvesting, but much less so in the Yakima area, where little or no rain fell until the fruit had been stored.

L. K. Jones ascertained that a few seedling potato strains, as well as the Katahdin variety [ibid., xiii, p. 591], showed marked resistance to natural infection by the veinbanding virus [ibid., xiii, p. 533; xiv, p. 246]. Further tests confirmed the view that tomato mosaic is not seed-borne [ibid., xii, p. 540].

The results of field tests by L. Campbell on the control of downy mildew of peas (*Peronospora pisi*) [*P. viciae*] with sulphur and copper fungicides were unsatisfactory. E. J. Anderson found in a detailed study of pea powdery mildew (*Erysiphe polygoni*) that the powdery mildews of garden peas, perennial peas, alsike clover [*Trifolium hybridum*], and

common knotweed [*Polygonum aviculare*] were morphologically similar; the conidia of the pea powdery mildew caused infection on perennial peas, but not on red clover [*T. pratense*], lucerne, sweet clover [*Melilotus alba*], or beans. Tests with perithecia collected during autumn indicated that the ascospores do not remain viable throughout the winter and possibly are not a source of infection in the spring.

In a plant disease survey by F. D. Heald, L. K. Jones, and G. A. Huber, a species of *Botrytis* was repeatedly isolated from blackberries affected with 'pink berry', a condition characterized by soft, reddish-pink drupelets on the ripened fruit. The sour cherry fruit disease known as 'pink cherry', characterized by uneven ripening and an internal necrosis, caused considerable damage in western Washington; it resembles 'buckskin' [ibid., x, pp. 323, 528] in many respects and is possibly a virus disease, but its transmissibility has not yet been demonstrated. Crinkle and, to a less extent, yellows [ibid., xiii, p. 313] are present in many strawberry plantings in western Washington.

SAGEN (H. E.), RIKER (A. J.), & BALDWIN (I. L.). **Studies on certain physiological characters of Phytomonas tumefaciens, Phytomonas rhizogenes, and Bacillus radiobacter. Part I.**—*J. Bact.*, xxviii, 6, pp. 571–595, 4 graphs, 1934.

A comparison was made of certain physiological characters of *Phytomonas* [*Bacterium*] *tumefaciens*, *P.* [*Bact.*] *rhizogenes* (the agents of crown gall and hairy root, respectively), and *Bacillus radiobacter*, a soil saprophyte resembling the first-named in various respects [*R.A.M.*, x, p. 167; xi, p. 357; xiv, p. 148], with special reference to their nitrogen and carbon metabolism. Most of the strains employed in the studies were progenies of single cells. The nine crown gall cultures were obtained from raspberry [ibid., xiii, p. 786], two cultures of the hairy root organism were from walnut and three from apple, six of *B. radiobacter* were from the United States Department of Agriculture and four from local (Wisconsin) sources.

Organic and inorganic nitrogen-containing compounds were utilized by *Bact. tumefaciens* and *B. radiobacter*, whereas *Bact. rhizogenes* made little or no growth either on single or mixed amino acids or on inorganic nitrogen. Nitrates were reduced only to a very slight extent by *Bact. tumefaciens* but completely by *B. radiobacter* in three weeks when glucose, raffinose, glycerol, mannitol, arabitol, or calcium gluconate were used as sources of carbon. When the various sugars, glucosides, and alcohols were used as a source of carbon, *B. radiobacter* produced an alkaline reaction in all cases of satisfactory growth except with propyl alcohol, in the presence of which both it and *Bact. tumefaciens* developed well and shifted the reaction towards acidity. The utilization of ethyl alcohol was accompanied by an acid reaction in *Bact. tumefaciens* and by an alkaline one in *B. radiobacter*. The basic reaction resulting from the assimilation of the organic acid salts may have been partly due to the more or less complete utilization of the acid radical with the basic ions remaining. An acid reaction developed in most cases of carbohydrate utilization by *Bact. rhizogenes*, while under the same conditions little or no acid was formed by *Bact. tumefaciens*. The lowest oxidation-reduction potential was induced by *B. radiobacter*.

HENDRICKSON (A. A.), BALDWIN (I. L.), & RIKER (A. J.). **Studies on certain physiological characters of Phytomonas tumefaciens, Phytomonas rhizogenes and Bacillus radiobacter. Part II.**—*J. Bact.*, xxviii, 6, pp. 596–618, 1 diag., 1 graph, 1934.

In further studies on the physiology of *Phytomonas* [*Bacterium*] *tumefaciens*, *P.* [*Bact.*] *rhizogenes*, and *Bacillus radiobacter* [see preceding abstract], 55 cultures (12 parents and 43 single-cell progenies) were employed. The sources of *Bact. tumefaciens* were galls on black raspberry [*Rubus occidentalis*], almond, walnut, and incense cedar [*Libocedrus decurrens*], while the hairy root cultures were all from apple. Grown on a medium consisting of 5 gm. glucose, 0·1 gm. sodium selenite, 15 gm. agar, and 1,000 c.c. of 1 per cent. yeast-water, and incubated at 20° C. for four days, *Bact. rhizogenes* was suppressed, while the other two developed profusely with a distinct red coloration due to the presence of free selenium. At a concentration of 1 to 10,000, dahlia eosin retarded the growth of *Bact. tumefaciens* and *Bact. rhizogenes* on a yeast-water mannitol agar medium, Bismarck brown and thionin also suppressing the latter. A distinctive feature of *Bact. tumefaciens* was its capacity to absorb aniline blue (1 to 10,000) from certain nutrient media at any reaction between P_H 4·4 and 8, a capacity not shown by the other two. Some aberrant crown gall cultures, however, though apparently equally virulent on young tomato plants with the normal type, failed to absorb aniline blue, and it was not absorbed by cultures on potato-dextrose agar.

Isolations of all three organisms lowered the oxidation-reduction potentials of a ferric-ammonium citrate and a yeast-water mannitol-aniline blue medium in a similar manner.

Variations in the physiological and pathogenic reactions of the 55 cultures were not obtained by continuous cultivation in artificial media. By successive passage through young tomato plants, however, the physiological (but not the pathogenic) behaviour of *Bact. tumefaciens* was modified in the following respects: failure to produce a serum zone in milk and to absorb aniline blue, production of an alkaline reaction and consequent pink colour in a potassium nitrate-glycerol-phenol red medium, and formation of rough colonies [ibid., xiv, p. 154].

Judged by their pathogenicity reactions, a near relationship is indicated between *Bact. tumefaciens* and *Bact. rhizogenes*, whereas a classification by physiological characters would closely unite the crown gall organism and *B. radiobacter*, with the hairy root agent in a more remote degree of relationship.

ADAM (D. B.) & PUGSLEY (A. T.). **'Smooth-rough' variation in Phytomonas medicaginis phaseolicola Burk.**—*Aust. J. exp. Biol. med. Sci.*, xii, 4, pp. 193–202, 1934.

Observations on Magnum Bonum bean (*Phaseolus vulgaris*) seeds at Melbourne showed that *Phytomonas* [*Bacterium*] *medicaginis* [var.] *phaseolicola* [*R.A.M.*, xiv, p. 72] may occur in at least two forms, smooth and rough [see preceding abstract], differing essentially in the same respects as the well-recognized S and R forms of the Gram-negative intestinal organisms. The R form gives a flocculent growth in broth and is relatively unstable in salt solutions (especially after heating at 100° C.)

and in undiluted bean 'sap'; it is also agglutinated in 0·2 per cent. trypaflavin. The S form gives a uniform turbidity in broth, is stable in salt solutions, both before and after heating, and in bean sap, and is not agglutinated in 0·2 per cent. trypaflavin. It was demonstrated by means of the agglutination test that the change from S to R involves a corresponding modification of the heat-stable or somatic antigen. The S strain was sensitive and the R non-sensitive to a bacteriophage obtained from diseased bean seeds. R was further less virulent than S, while a third variant, RV, was shown to be non-pathogenic to beans.

Verona (O.). **Recherche d'un principe lysant dans les terres cultivées.** [A search for a lytic principle in cultivated soils.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vi, 11, pp. 427–430, 1934.

After pointing out that numerous attempts have been made to isolate a bacteriophage [*R.A.M.*, xiii, p. 748] from the water of sewers, rivers, and lakes as well as from sea-water, the author states that the first record of the isolation of a bacteriophage from soil was made in 1920 by Dumas who in manured ground found a bacteriophage active towards *Bacterium* [*Bacillus*] *dysenteriae* and *Bact.* [*B.*] *coli.* The evidence obtained in the author's experiments with different soils and bacteria indicated that a bacteriophage is present in cultivated soil only when there is association between it and a bacterium; this occurs only with pathogenic organisms [cf. ibid., xiii, p. 697] and *Bact. radicicola.*

Rouzinoff (P. G.). Исследование вредоносности некоторых болезней хлебных злаков в полевых условиях. [Investigation of the degree of injury caused by certain cereal diseases in the field.]—*Bull. Pl. Prot. Leningr.*, Ser. II (*Phytopath.*), *1934*, 4, pp. 5–30, 1934. [English summary.]

From a cursory review and discussion of the methods usually employed for estimating the injury caused by parasitic diseases to cultivated crops the author concludes that the only method capable of giving reliable results under field conditions is that of a direct comparison of the yields of healthy and of diseased plants in the same field. His preliminary experiments in the droughty steppe region of south-western Russia and in moist regions of the Russian Far East indicated the existence of a distinct direct relationship between the height of the culms of cultivated cereals and their yield in grain, on the one hand, and the intensity of the attack on them by certain diseases, on the other, the relationship in this case being either direct or inverse, according to the disease. For this reason he suggests a method consisting in collecting separately randomized samples of healthy, and of slightly, moderately, and heavily infected plants from the whole field, each class being then subdivided into five to seven sections according to the length of the culms, and the reduction in yield of each subsection determined in percentages of the yield of the longest healthy culms. The actual working formulae for obtaining the relative and total figures of the losses are indicated. In determining rust injury, however, the length of the culms should be measured only from the basal node to the node bearing the topmost leaf, since observations indicated that the portion above this (including the ear) is considerably more stunted by rust

attack than the rest of the plant, and since no correlation could be determined in rusted plants between the length of the culm to this point and the length of the apical portion.

This method is amply illustrated by concrete examples of the damage done in 1932 and 1933 by four cereal rusts, chiefly in the Far East. The greatest injury was caused by the linear [yellow] wheat rust [*Puccinia glumarum*] which attacked particularly severely hard wheats which are usually considered to be resistant. This rust, as well as brown rust [*P. triticina*], affected shorter culms more heavily than the longer ones, while in 1933 the taller culms of oats appeared to be more heavily infected by crown rust [*P. lolii*] than the shorter, presumably owing to the peculiar climatic conditions of that year.

The investigation was also extended to some other cereal diseases usually considered to be of minor importance, such as, for instance, leaf spots caused by *Helminthosporium* and *Septoria* spp., the results indicating that the damage done by them is more important than commonly assumed. In general, it is stated that the economic effect of a complex of diseases affecting a crop cannot be determined by simply adding up the yield reduction attributable to each disease individually.

Toumarinson (C. S.). К физиологическому обоснованию шкал учета вредоносности ржавчины. [On the physiological basis of scales for estimating the injuriousness of rust.]—*Bull. Pl. Prot. Leningr.*, Ser. II (*Phytopath.*), *1934*, 6, pp. 35–56, 1 diag., 1934. [English summary.]

After pointing out that the scales hitherto used for the estimation of the intensity of rust attack do not reflect the internal processes that take place in the diseased plant, the author states that his observations of the latter in oat plants artificially infected with crown rust (*Puccinia coronifera*) [*P. lolii*: see preceding abstract] indicated that in the case of cereal rusts a scale based on the percentage of leaf area covered by the pustules of the rust may be fairly accepted for the estimation of the injury, on condition that the degree of infection should be determined in connexion with the stage of development of the plant at the moment of inoculation, the development stage of the fungus, and the meteorological and other environmental conditions which prevailed during the experiment. A still greater degree of accuracy may be attained by including the area of the spots around the pustules, as the work showed that the injury done to the host rapidly increases with increase in the area of these spots.

Tranzschel (V.). Промежуточные хозяева ржавчины хлебов и их распространение в СССР. [Alternate hosts of cereal rusts and their distribution in U.S.S.R.]—*Bull. Pl. Prot. Leningr.*, Ser. II (*Phytopath.*), *1934*, 5, pp. 4–40, 1934. [German summary.]

In this paper the author gives a summarized account of the work done up to date both abroad and in Russia in the search for alternate hosts of the rusts of cultivated cereals. He gives an exhaustive descriptive list of the species of barberry which have so far been found to harbour *Puccinia graminis* in the U.S.S.R., with their geographical distribution. In a comprehensive review of experimental work, mainly abroad, on

the transmissibility of crown rust (*P. coronifera avenae*) [*P. lolii*] from oats to other Gramineae and vice versa, he concludes that the form specialized on oats can only attack other species besides oats and wild oat grasses under favourable experimental conditions. An annotated list is given of the species of *Rhamnus* which occur in Russia, indicating those on which rust aecidia have been found, though their pathogenicity to oats has not been tested from many species; *R. dahurica* and *R. pallasii*, which are very widespread throughout the U.S.S.R., require further testing.

A detailed account is given of Main's and Jackson's experiments in the United States [*R.A.M.*, xii, p. 499] on the aecidial stage of brown wheat rust [*P. triticina*] on species of *Thalictrum*, and of Eremeyeva's experiments in Russia in 1926 [cf. ibid., v, p.25] in successfully infecting with teleutosposes from wheat *T. exaltatum*, *T. glaucum*, *T. nutans*. *T. ruthenicum*, *T. tuberosum*, *T. corynellum*, *T. elatum*, *T. adiantifolium*, and *T. minus*, and back inoculating from the aecidia to *Triticum vulgare*, *T. durum*, *T. spelta*, and rye, but not to barley. Eremeyeva's *Thalictrum* plants, however, were grown from seed imported from Turin and Kew, and since there is a distinct possibility of hybridization of the species when cultivated in botanic gardens, this may explain certain discrepancies between her results and those obtained in America, where *T. minus* was found not to be susceptible. A complete list is given of the species of *Thalictrum* occurring in Russia, many of which have not yet been tested for their susceptibility to *P. triticina*, as well as a summary of experiments to determine the transmissibility of the rust to other Gramineae, in which the author readily succeeded in infecting *Aegilops crassa* and *A. cylindrica* with uredospores from wheat.

Among the Russian species of *Anchusa*, the alternate host of brown rust of rye (*P. dispersa*) [*P. secalina*], an annotated list of which is given, aecidia have been found on *A. officinalis*, *A. gmelini* growing mixed with the wild grass *Secale fragile*, and *A. ochroleuca*. Aecidia were also found on *A. myosotidiflora*, but are not believed to belong to this rust. In dealing with the Russian species of *Ornithogalum* (which are arranged according to a new unpublished revision of the genus by H. Krasheninnikoff), the alternate host of brown barley rust (*P. anomala*), the author states that in 1926 in the Crimea he successfully inoculated *O. fimbriatum* and *O. narbonense* with teleutospores from rusted barley straw. A brief reference is also made to his success in 1905 in infecting *Oxalis corniculata* with teleutospores of maize rust (*P. maydis*) and returning the rust from *O. corniculata* to maize. Aecidia of the rust have apparently not yet been observed in nature on species of *Oxalis* in the U.S.S.R., where two, *O. stricta* and *O. corniculata*, are widely distributed.

In the last section the author discusses at some length the reasons which lead him to believe that the aecidia of *Aecidium valerianellae* Biv. which are abundantly found on species of *Valerianella* in the Crimea and Caucasus belong to *P. glumarum*.

Sibilia (C.). **Relazione sulle esperienze di lotta diretta contro le ruggini del Grano.** [An account of experiments on the direct control of Wheat rusts.]—*Boll. Staz. Pat. veg., Roma*, N.S., xiv, 3, pp. 327–333, 2 figs., 1934.

In an experiment carried out near Alessandria, northern Italy, in

1934, a field of Damiano Chiesa and another of Edda wheat received, respectively, eight and four applications (made during May and June, at the rate of 40 kg. per hect.) of natural sulphur from the Romagna [cf. *R.A.M.*, viii, p. 701], two other fields of the same varieties being left untreated as controls. At the time of the first application the plants showed some infection by *Puccinia triticina* and *P. glumarum* and a trace of *P. graminis*. After harvesting, the treated Damiano Chiesa wheat showed an increase in yield of 1·6 quintals per hect. and an increase in specific weight of 2·2 kg. per hectol. over the control, the net profit given by the dusting (all costs deducted) on this variety amounting to 20 lire per hect., which, rust infection being extremely slight, is considered to be a satisfactory result. The treated Edda wheat showed an increased specific weight of 700 gm. per hectol., as compared with the control.

ANDERSON (J. A.). **Studies on the nature of rust resistance in Wheat. VI. Effect of hydrogen ion concentration, phenolic compounds, and host extracts on the germination of urediniospores of Puccinia graminis tritici, form 21.**—*Canad. J. Res.*, xi, 6, pp. 667–686, 2 graphs, 1 diag., 1934.

After a brief review of the work hitherto done in the investigation of the nature of resistance of wheat to black rust (*Puccinia graminis tritici*), with particular reference to Ezekiel's study of the effect of very dilute host extracts on the growth of the germ-tubes of the uredospores in hanging drops [*R.A.M.*, x, p. 712], the author gives details of experiments in which he tested the inhibitory action of more concentrated solutions (15, 10, 5, and 2·5 per cent.) of extracts from Vernal, Khapli, Marquis, and Little Club wheats (the first two of which are resistant and the others susceptible) both on the growth of the germ-tubes and on the germination of the uredospores of form 21 of the rust. The results [which are shown in tables and are analysed by statistical methods] indicated that the relative inhibitory properties of extracts taken from day to day varied, presumably owing to differences in the environmental conditions under which the plants were grown; this view was supported by the fluctuations from series to series in the relative quantities of total solids in the expressed juice of the different varieties, and by similar variations in hydrogen-ion concentration, in regard to which preliminary experiments showed that maximum uredosporal germination in this form of the rust occurred between P_H 5·8 and 6·5, with indications that the optimum lies in the neighbourhood of 6·2. Variations in total solids, however, did not consistently affect the results of the tests, suggesting that the quantities of the various compounds (including the inhibitory ones) in the expressed juice varied independently, though it is also possible that physical properties not reflected by an estimate of total solids are important factors. In no case was the extract from a variety shown to have a significantly greater inhibitory effect than that of another variety at one concentration and a significantly lesser effect at another.

Both tests showed that differences exist between the average inhibitory effects of the extracts of certain of the wheat varieties, the order of increasing inhibitory effect both on germination and on growth being

Vernal, Marquis, Khapli, and Little Club; the results as a whole failed to show any relation between the inhibitory effects of the extracts and rust resistance of the variety.

In a collateral series of experiments the germination of the uredospores was studied in buffered and unbuffered solutions of 23 pure phenolic compounds. Among the results obtained it was noted that a 200 p.p.m. phenol solution, which had a comparatively slight effect on germination, considerably stimulated the growth of the germ-tubes, but that both germination and growth were increasingly inhibited at increasing concentrations, until at 600 p.p.m. no germination or growth occurred. The results of this investigation, taken in conjunction with those of Ezekiel's work, suggest that host extracts behave similarly, i.e., that although they reduce growth of the fungus at high concentrations, they stimulate it at very low ones.

Straib (W.). **Untersuchungen zur Genetik der Gelbrostresistenz des Weizens.** [Investigations on the genetics of yellow rust resistance in Wheat.]—*Phytopath. Z.*, vii, 5, pp. 427–477, 1934.

In the writer's studies on the mode of inheritance of resistance to 18 physiologic forms of yellow rust (*Puccinia glumarum*), including all those prevalent in Germany [*R.A.M.*, xiii, pp. 756–7], absolute immunity was found, in every cross in which it occurred, to constitute a dominant character dependent on a single factor, irrespective of the varietal reaction of the non-immune parent. The type *i* reaction, therefore, must be sharply differentiated from all other types of infection, in contradistinction to the results obtained by Stakman and Levine and other American workers with various rusts, in which there is no well-defined line of demarcation between absolute immunity, relative immunity, and pronounced resistance [cf. ibid., ii, p. 158 *et passim*]. As regards previous studies on the inheritance of reaction to *P. glumarum* [cf. ibid., xii, p. 208; xiii, p. 619], it is pointed out that the conception of immunity was interpreted by the workers in question as relative and not absolute, hence their conclusions that the character is inherited in a dominant form but not consistently by monofactorial segregation.

Relative resistance may be transmitted by one or more factors according to the varieties used as parents and the physiologic form of *P. glumarum* employed as inoculum, and may be dominant, intermediate, or recessive to high susceptibility. From the genetic standpoint, it is just as feasible to work with varying grades of susceptibility as with resistance and susceptibility. In this connexion it is important to note that the dominance ratios vary even where the parent varieties are quite consistent in their reaction to the different physiologic forms of *P. glumarum*. In a given cross, the reaction towards one group of physiologic forms may be inherited quite independently of that towards another. Transgression in the direction of enhanced susceptibility was demonstrated in the cross between Rümkers Sommerdickkopf and Heines Kolben.

Discussing the bearing of these results on practical breeding for resistance to yellow rust, the evidence obtained that the physiologic forms may be arranged in groups which react similarly to infection, and

evidently all contain similar factors for resistance and susceptibility, introduces a considerable simplification by greatly reducing the number of individual forms of the rust to be used in varietal reaction tests. Under greenhouse conditions it is evidently possible to select lines of 42-chromosome wheats possessing resistance to, or immunity from, all the known physiologic forms of *P. glumarum*.

SHEN (T. H.). **The inheritance of resistance to flag smut (Urocystis tritici Koern.) in ten Wheat crosses.**—*Bull. Nanking Coll. Agric. For.* 17 (N.S.), 16 pp., 1934.

In a study of the resistance of wheat to flag smut (*Urocystis tritici*) [*R.A.M.*, xiii, p. 752] at Nanking ten crosses were made between (1) nearly immune varieties, (2) nearly immune and very susceptible strains, (3) nearly immune and susceptible strains, and (4) resistant and susceptible strains.

The F_2 plants from the cross Pathology Head 4592 (nearly immune) × Pathology Head 1102 (very susceptible) segregated into 195 smut-free and 19 smut-susceptible plants. The susceptible plants in the F_2 bred true in the F_3 progenies, giving from 4 to 30 per cent. infection, while the smut-free ones showed further segregation. One of the former families showed greater susceptibility than the susceptible parent of the cross. From the smut-free families in the F_3, 1507 plants were selected for a further test and most of the F_4 families were found to be smut-free. According to the results in the F_4 three of the F_3 progenies were as resistant as the nearly immune parent.

With the cross Nanking 26 (fairly susceptible) × Nabawa (nearly immune) there were in proportion more smutted plants in the F_2 and smutted families in the F_3 than in the cross described above, but the percentage of smut in the F_3 families was lower indicating that fewer genes were involved in this cross than in Pathology Head 4592 × 1102. No progenies in the F_4 showed any smut.

Out of 394 plants in the F_2 of Pathology Head 4592 × Nabawa two were partially smutted, indicating that the parents have different genotypes.

With Pathology Head 4084 (nearly immune) × Reward (susceptible) there was only 1 smutted among 132 F_2 plants, while in the F_3 families only 7 out of 24 showed slight smut, indicating that Reward contributed only a few minor susceptible genes and that the other parent had all dominantly resistant genes.

With Pathology Head 4666 (nearly immune) × Kiangsi Early (susceptible) there were 26 smutted out of 432 F_2 plants. Twenty-two out of 40 F_3 families were smutted but showed a wide range in the percentage of smut, which in 11 families was much higher than in the susceptible parent. This cross indicated transgressive inheritance. The nearly immune parent evidently contains susceptible as well as resistant genes.

It is concluded that the major genes for resistance of wheat to flag smut are not numerous, the results obtained with three of the crosses indicating the existence of only three pairs of genes.

The evidence obtained showed that there was no correlation between flag-smut resistance and hairiness of the glume or the presence or absence of awns.

BIRAGHI (A.). **Ricerche citologiche sulla germinazione delle clamidospore di 'Urocystis tritici' Koern.** [Cytological researches on chlamydospore germination in *Urocystis tritici* Koern.]—*R. C. Accad. Lincei*, xx, 9, pp. 343–346, 1934.

The writer has carried out a study on chlamydospore germination in *Urocystis tritici*, the cause of flag smut of wheat [see preceding abstract], with the object of amplifying and elucidating certain aspects of Noble's work on the same fungus [*R.A.M.*, xiii, p. 431]. The process was found to follow the same lines as those described by Kniep and Rawitscher, respectively, for *U. anemones* and *U. violae* [ibid., i, p. 451].

GASSNER (G.) & KIRCHHOFF (H.). **Zur Frage der Beeinflussung des Flugbrandbefalls durch Umweltfaktoren und chemische Beizmittel.** [On the question of the influence of environmental factors and chemical disinfectants on the incidence of loose smut.]—*Phytopath. Z.*, vii, 5, pp. 487–503, 1934.

The incidence of both wheat and barley loose smuts [*Ustilago tritici* and *U. nuda*] was found to be somewhat higher in light clay-sand than in heavy soils. The use of a complete fertilizer tended to reduce the amount of infection as compared with that in the plots in which any one of the main constituents was omitted. Low germination temperatures also caused a decline in the incidence of the smuts. The addition of a chemical disinfectant, e.g., germisan, to the steeping water used in the hot water treatment of the two diseases is liable to counteract the beneficial action of the latter on the seed-grain by the introduction of osmotically active substances which reduce the intake of water.

KOTTE (W.). **Die Federbuschsporen-Krankheit des Getreides.** [The plumed spore disease of cereals.]—*Nachr. SchädlBekämpf., Leverkusen*, ix, 4, pp. 170–174, 2 figs., 1934.

Since the war considerable damage has been caused to the wheat crops in western Germany by the plumed spore disease (*Dilophospora alopercuri*) [*R.A.M.*, xiii, p. 624], which also attacks rye and oats. In the Rhine Province losses up to 30 per cent. of the wheat stands have been reported. Inoculation experiments are stated to have proved conclusively that there is no necessary connexion between the plumed spore disease and eelworms (*Tylenchus* [*Anguillulina*] *tritici*), their frequent association merely denoting their common response to defective sanitation in the field. The fungus is seed-borne and capable of attacking the germinating seed-grain without external aid, so that seed-grain treatment should certainly be practised for the control of the disease.

NISIKADO (Y.), MATSUMOTO (H.), & YAMAUTI (K.). **Physiological specialization of Gibberella saubinetii (Mont.) Sacc., in its pathogenicity to Wheat seedlings.**—*Ann. phytopath. Soc. Japan*, iv, 1–2, pp. 1–12, 1934. [Japanese, with English summary.]

Inoculation experiments with conidial suspensions of 124 strains of *Gibberella saubinetii*, which causes very serious head and seedling blights of wheat [*R.A.M.*, xiii, p. 263], barley, and other cereals in

Japan, showed that a wide range of pathogenicity on wheat seed-grain exists in strains from wheat and barley in different parts of the country. For instance, with some strains the differences between the mean percentages [shown in tables] of healthy seedlings in the inoculated and control lots were 20 to 50 times as great as the probable errors, indicating a high degree of pathogenicity, whereas in others the corresponding figures were only 3 to 5 times, probably denoting non-pathogenicity. In addition to these extremes there were a number of strains of an intermediate order of virulence.

AGRONOMOFF (E. A.), DOUNIN (M. S.), BUNDEL (A. A.), GORYATCHIKH (A. N.), & KORENEFF (N. A.). Биохимия и микробиология фузариозного зерна Пшеницы при его хранении. [Biochemistry and microbiology of stored Wheat grain infected by *Fusarium*.]—ii+96 pp., 17 figs., 19 graphs, Снабтехиздат. [Food Supplies Tech. Publ. Office], Leningrad, 1934.

This little book is divided into three sections. The first (by Dounin and Goryatchikh) deals with various methods usually employed for the qualitative analysis of wheat samples to determine the degree of contamination by pathogenic and saprophytic micro-organisms, with particular reference to species of *Fusarium*, some of which are known to develop in the affected grain substances toxic to man and to animals [*R.A.M.*, v, p. 543], besides considerably impairing the viability of the seed. Attention is drawn to the almost complete absence, both in phytopathological literature and in the local or international rules concerning seed testing, of definite and uniform instructions for the examination of cereal grain, and a full account is accordingly given of the authors' detailed macroscopical and cultural investigation of wheat and rye samples from the 1932 crop in North Caucasus. The results demonstrated that the degree of contamination by *Fusarium* spp. cannot be determined macroscopically. Most of the grain examined was infected with a very complex bacterial and fungal flora, among which species of *Fusarium* occupied an insignificant place, while bacteria, apparently *Bacterium atrofaciens*, *Bact. translucens* var. *undulosum*, and *Micrococcus tritici* [ibid., iv, p. 530], were widely represented. The germination tests were prolonged up to 11 or 12 days, a time which was found to be necessary to obtain a complete determination of all the micro-organisms present, by the use of a special type of germinator in which each grain was isolated from the others. In a further modification the atmosphere can be kept saturated with moisture, thus ensuring a perfect control of bacterial development while promoting fungal growth, the optimum temperature for which was found to lie between 20° and 25° C. Among the species of *Fusarium* identified, the most frequent were *F. moniliforme* [*Gibberella moniliformis*] (presumably because of its widespread occurrence on maize and certain other crops in North Caucasus), *F. culmorum*, *F. nivale* var. *majus* [*Calonectria graminicola* var. *neglecta*], and *F. solani* var. *minus*.

In the second section (by Agronomoff, Koreneff, Bundel, and Goryatchikh) the results are given of experiments to determine the behaviour of healthy and infected wheat grain under various conditions of storage. Naturally air-dry or artificially dried wheat kept in a dry

atmosphere did not give a growth of *Fusarium* even when these fungi were known to be present, and they eventually died out. In damp grain and under moist conditions a marked development of *Fusarium* was noted at first, associated with a rise in the P_H value of the substratum, but later bacteria took the upper hand, terminating in the almost complete elimination of the fungi. Heating the infected grain at 60° and 80° C. for one hour before storing did not kill the mycelium but markedly reduced its vigour; heating at 100° for the same length of time entirely suppressed the *Fusarium* spp. but also destroyed the germinability of the grain and promoted the growth of other mould fungi (particularly *Penicillium* and *Aspergillus*) even in wheat stored under comparatively dry conditions. The viability of the bacteria was but slightly reduced by heating at 100°. Biochemical investigation showed that the enzymic activity of the wheat grain was increased in samples exhibiting mixed infection, and the changes brought about in the chemical constitution of the grain by the activity of the bacteria and fungi are described in some detail; it was found that damp wheat containing a mixed infection kept under moist conditions loses considerably in nutritive properties.

The third section (by Dounin) is an attempt to formulate a set of instructions, based on the work described above, for making a macroscopical and biological analysis of cereal grains both for home needs and for export requirements.

GREANEY (F. J.) & MACHACEK (J. E.). **Studies on the control of root rot diseases of cereals caused by Fusarium culmorum (W. G. Sm.) Sacc. and Helminthosporium sativum P., K., and B. I. Field methods with root rot diseases.**—*Sci. Agric.*, xv, 4, pp. 228–240, 1934. [French summary.]

In the authors' three years' field tests [the results of which are tabulated and discussed] conducted at Winnipeg to devise an effective method of artificially inducing for experimental purposes epidemic attacks of the cereal root rots caused by *Fusarium culmorum* and *Helminthosporium sativum* [*R.A.M.*, xiii, p. 362], the amount of disease developing in the plots was expressed as a 'disease rating', the value of which represented the percentage number of plants affected and the degree of infection. Each year the disease rating in a series of plots of Marquis wheat was varied by adopting different methods of introducing the fungi into the soil, and in the final analysis of all the results the ratings for each plot were correlated with the yields, this relationship being expressed as a 'correlation coefficient'. The values given by these coefficients were highly significant, the disease rating accurately measuring the amount of infection produced. Attack by either fungus markedly reduced the yield.

The best method of inducing a severe attack by *F. culmorum* consisted in adding a spore suspension to the seed-grain before sowing, while the most satisfactory results with *H. sativum* were obtained by a combination of this method with the application of oat hull inoculum to the soil. None of the methods tested gave a really epidemic attack by *H. sativum*.

The results obtained are considered as clearly demonstrating the value and importance of plot arrangement and statistical methods in the interpretation of field experiments on cereal root rots.

Böning (K.) & Wallner (F.). **Keimlingsbefall und sonstige Erkrankungen durch Helminthosporium sativum P. K. und B. an Gerste in Bayern.** [Seedling infection and other pathological conditions of Barley in Bavaria due to *Helminthosporium sativum* P., K., and B.]—*Prakt. Bl. Pflanzenb.*, xii, 9, pp. 257–279, 5 figs., 3 graphs, 1934.

The occurrence of *Helminthosporium sativum* on field barley in Germany [*R.A.M.*, xiv, p. 159] was first detected by the writers in Upper Franconia in 1931; subsequently the fungus, which under local conditions appears chiefly to attack seedlings, was found near Munich and elsewhere, as well as in a number of seed samples. The symptoms of the seedling blight are described in relation to the life-history of the pathogen and its mode of infection (through the seed-grain or from the soil) and control, while the results of morphological and cultural studies are tabulated and discussed in some detail. Repeated attempts to obtain the development of perithecia in pure cultures of the fungus failed. Adequate though not complete control of the seedling blight was obtained by seed-grain disinfection with various brands of the standard fungicides, germisan, ceresan, uspulun, and fusariol, as officially recommended against stripe disease (*H. gramineum*) [ibid., xiv, p. 20].

Appel (O.). **Streifenkrankheit und Blattfleckenkrankheit der Gerste.** [Stripe disease and leaf spot disease of Barley.]—*Dtsch. landw. Pr.*, lxi, 51, p. 627, 1 col. pl., 1934.

This is a semi-popular note on the symptoms of stripe disease of barley, the life-history of the causal organism (*Pleospora* [*Pyrenophora*] *trichostoma*), usually found in its conidial form (*Helminthosporium gramineum*), and its control by treatment of the seed-grain with certain officially recommended fungicides [see preceding abstract]. The leaf spot [net blotch] due to *H. teres* [*R.A.M.*, xiv, p. 159] is stated to be generally of slighter importance and less widespread in Germany than the foregoing; it may be combated where necessary by the same disinfectants.

Nisikôri (T.). **Parasitic relation of Puccinia triticina Eriks. to Barley. I.**—*Ann. phytopath. Soc. Japan*, iv, 1–2, pp. 13–20, 3 figs., 1934. [Japanese, with English summary.]

Seedlings of 13 barley varieties inoculated at the Phytopathological Laboratory of Tokyo University with uredospores of *Puccinia triticina* from wheat proved to be susceptible in the summer and autumn [*R.A.M.*, xii, p. 274]. The uredosori on barley seedlings are fewer and smaller than those on wheat, but there was no diminution of virulence in the uredospores produced on the former host, which were able to reinfect both wheat and barley. In winter inoculations barley seedlings showed a high degree of resistance to *P. triticina*; the germ-tubes enter the leaves freely through the stomata, but some of the infecting hyphae cease growth, producing only the rudiments of haustoria, and soon die. The cell walls of the tissues in contact with these dead hyphae are swollen and stain vividly with safranin. A few haustoria may develop, but sooner or later they collapse and die, together with the invaded cells.

KOKIN (A. J.). & TOUMARINSON (C. S.). Физиологическое обоснование вредоносности ржавчины Овса **Puccinia coronifera Kleb.** [The physiological basis of the injuriousness of the Oat rust *Puccinia coronifera* Kleb.]—*Bull. Pl. Prot. Leningr.*, Ser. II (*Phytopath.*), *1934*, 6, pp. 5–34, 13 graphs, 1934. [English summary.]

The results of the experiments reported at length in this paper showed that in oat (Golden Rain) plants artificially infected with crown rust (*Puccinia coronifera*) [*P. lolii*] in the greenhouse the energy of CO_2 assimilation was, as a rule, lower than in the controls, the decrease in the energy increasing with the intensity of infection with the rust and being especially marked at the time when the fungus passes into its teleutospore stage. Intensity of respiration, on the other hand, increased in the slightly rusted and, to a somewhat lesser degree, in the moderately rusted plants; in heavily attacked plants, however, it was generally lower than in the controls. It was also shown that the amount of soluble carbohydrates, proteids, and chlorophyll in the oat leaves decreased with the intensity of the rust, and that the destruction of the chlorophyll-bearing parenchyma is one of the chief causes of the untimely death of the affected plants. In heavily infected plants the weight of the grain produced was reduced by 28·63 per cent. as compared with the controls, and the content of the grain in proteids by 3·45 per cent.

GASSNER (G.) & KIRCHHOFF (H.). **Einige Versuche zum Nachweis biologischer Rassen innerhalb des Roggenbraunrostes, Puccinia dispersa Erikss. und Henn.** [Some experiments for the demonstration of biologic races within the brown rust of Rye, *Puccinia dispersa* Erikss. and Henn.]—*Phytopath. Z.*, vii, 5, pp. 479–486, 1934.

The behaviour of ten monospore lines of brown rust of rye (*Puccinia dispersa*) [*P. secalina*: *R.A.M.*, xiii, pp. 430, 752] from various parts of Germany was studied on three ryes (Petkus winter, Jägers North German Champagne, and Schrickers Gottlieb winter). Indications of the existence of physiologic specialization within the rust were afforded by the differential reaction of the host plants, especially in the extent to which teleutospores were formed, but owing to the difficulty of obtaining genotypically pure rye varieties it was not possible to follow up this line of work. Advantage was, therefore, taken of the fact that *P. secalina* can cause uredo pustules to develop on certain wheat varieties and on others causes a characteristic necrosis or chlorosis. Generalized necrosis developed in *Triticum durum* var. *melanopus* as a reaction to all the ten lines of *P. secalina* used in the tests. Isolated uredosori were formed on *T. vulgare* var. *lutescens* (Litowska and Aleph), *T. compactum* var. *wernerianum*, and *T. dicoccum* var. *atratum*, inoculations with the spores of which on rye resulted in the typical symptoms of *P. secalina*. In most of the wheat varieties, however, no uredospores were formed. Chlorotic and necrotic lesions developed on *T. spelta* var. *coeruleum* as a sequel to infection by all the lines of the rust. Red Chanson Fall Goldcoin (*T. vulgare* var. *milturum*), Winter Banat (var. *erythrospermum*), and Svalöfs Panzer reacted by generalized chlorosis to each of the lines.

As a result of these tests, 28 varieties of wheat were selected as differential hosts, and inoculations on these indicated the existence of at least two physiologic forms of *P. secalina*.

TOXOPEUS (H. J.). **Onderzoekingen over den invloed van temperatuur en vochtigheid op de levensprocessen van Phytophthora parasitica.** [Investigations on the influence of temperature and humidity on the vital processes of *Phytophthora parasitica*.]—*Landbouw*, ix, 8, pp. 385–421, 6 graphs, 1934. [English summary.]

In this further account of his investigations [the results of which are fully discussed and tabulated] from 1928 to 1931 on the relation of environmental factors to the orange gummosis caused by *Phytophthora parasitica* in eastern Java [*R.A.M.*, xii, p. 212], the writer states that infection is most abundant during the second half of the rainy season, outbreaks of the disease being closely connected with heavy precipitation.

The chief habitat of the fungus being the soil, an examination was made of the temperature and moisture content of the upper 2 cm. of soil in a garden at Poenten (1,000 m. above sea level). According to the season the moisture content was found to range from an air-dry condition (10 per cent.) in the dry season to 10 to 50 per cent. during the wet monsoon, while the temperature in a loose moist soil fluctuated between 26° and 60° C. (persistent rain and unbroken sunshine, respectively). Under laboratory conditions the optimum temperature for mycelial growth of the parasite is apparently 31°. A daily increase of temperature for a number of days to 35° suffices to arrest its development, which is resumed, however, after one day on transference to 22°. A daily increase to 40° or above greatly impairs the vitality of the organism, while even an hour's exposure to a temperature of 50° probably destroys it. Mycelial growth occurs only in the presence of moisture. In air-dry soil life is maintained for over six months, but the mycelium is weakened to such an extent that even on transference to very favourable conditions it is unable to start growing until after a fortnight.

Sporangia are formed in profusion from 24° to 29° in the presence of moisture and an abundance of oxygen. The liberation of the zoospores from the sporangia is conditioned by sudden rises or falls of temperature. It was experimentally shown that with initial temperatures above 18° only a drop sets free the zoospores, provided the end temperature is below 24°. With initial temperatures below 15° liberation is effected only by a rise, provided the end temperature exceeds 15°. Hence the rapid drop in temperature at the beginning of a shower is usually sufficient to induce the release of the zoospores. It was further shown that zoospores can be liberated by sporangia kept for three weeks in air-dry soil, while under very humid conditions their release may still be effected after 45 days. After five minutes' exposure to 37° or one hour at 34° the sporangia lose their capacity for zoospore formation. In the soil a daily rise of temperature is particularly injurious to the fungus where the moisture content is low.

From an experiment in which the natural conditions prevailing between 5th and 11th February, 1931, were simulated, it may be concluded that four to six days of dry, sunny weather are enough to prevent zoospore formation at the onset of a shower. During the dry monsoon

the fungus suffers extensively, and only when the wet season is in full swing and the soil is constantly moist for three or four weeks at a time can it recover sufficiently to produce abundant zoospores and so cause fresh infections. Within the wet monsoon only dry periods of at least six days' duration are likely to cause any appreciable damage to *P. parasitica*, the growth of which is then once more temporarily inhibited.

Gumming disease has been observed in Java only at altitudes exceeding 400 to 500 m., the soil temperatures in the plains being evidently too high for profuse mycelial growth or at any rate for zoospore production.

DUFRÉNOY (J.) & REED (H. S.). **Effets pathologiques de la carence ou de l'excès de certains ions sur les feuilles des Citrus.** [Pathological effects of the deficiency or excess of certain ions on Citrus leaves.]—*Ann. agron., Paris*, iv, 5, pp. 637–653, 10 figs., 1934.

A brief account is given of the authors' histological examination of citrus leaves affected with mottle leaf disease [*R.A.M.*, xiii, p. 692], the results of which indicated that the trouble appears to be related to the inability of the meristematic tissues of affected trees to use the soluble glucides reaching them; instead of serving for the synthesis of new substances, the glucides are accumulated in the mitochondria which are thus transformed into amyloplasts, the resulting starch being accumulated at the level of the developing buds, the further growth of which is inhibited. Microchemical tests showed that the cells of the leaves of diseased trees do not contain zinc, while this element was found to be comparatively abundant in the ash of leaves from mottle leaf trees which had been sprayed with zinc sulphate. It is believed that zinc salts play a part in the dehydrogenization process of the cell contents, and influence the oxido-reduction potential and consequently the ratio of the nitrites to nitrates in the cells, the former of which are toxic to citrus tissues.

MALENÇON (G.). **La question du bayoud au Maroc.** [The problem of the baïoud disease in Morocco.]—*Ann. Cryptog. exot.*, vii, 2, pp. 43–83, 6 pl., 1 fig., 1 map, 1934.

After a brief summary of the knowledge so far available of the etiology of the baïoud disease (*Fusarium albedinis*) of the date palm in Morocco [*R.A.M.*, xiii, p. 505] (in which it is stated that the pathogenicity of *F. albedinis* has not yet been established experimentally by inoculations), the author discusses at length his observations in the infected regions of the French Protectorate, all of which tend to confirm the view that this fungus is the primary cause of the trouble. Indirect evidence indicated that the organism enters the host chiefly, if not exclusively, through ragged wounds in the rachides of the leaves, caused by the careless cultural practices of the natives or by accident, while the spread of the infection by pruning tools or by insects would appear to be very exceptional, if it occurs at all. There was ample evidence that once the fungus reaches the stem, it spreads very rapidly upwards and downwards through the trunk, and in cases where several stems arise from one common stock, infection of one invariably leads to the infection of all through their common base. The observations also indicated

that *F. albedinis* remains alive for considerable periods inside the tissues of infected palms even after their death, and that a common source of infection in palm groves is supplied by fallen palm débris, and even by ropes, baskets, and other articles made of the bark or wood of infected palms. As a result of these observations, the author makes some suggestions for the possible control of the spread of the disease, but admits the difficulty of the problem owing to the inertia and ignorance of the local inhabitants.

In dealing with the geographical distribution of the disease in southern Algeria and Morocco, the author states that according to the local popular belief the trouble first started in the valley of the Drâa in Morocco, whence it spread eastwards to the Ziz and subsequently reached Bou-Denib and the south of Algeria. This view, however, should be accepted with reservations, since no mention of the disease is made by de Foucault in his reports on his visit to western Morocco, including the valley of the Drâa, in 1883, although the cultivation of the date palm in that region is briefly discussed by him. The present limits of the disease appear to be: in the north, the Atlas mountain range; in the south, the furthest limit to which the date palm is found; in the west, a line at some distance from the coast marked by the Anti-Atlas and other mountain ranges; and in the east, the eastern Grand Erg, though since it has reached not only the valleys of the Zousfana and Saoura as far south as the Oasis of Buda, but also is extending eastwards in the direction of El Golea through Adjir and Fatis, the main south Algerian date palm areas appear to be threatened. The author believes that the disease is of long standing in several foci in the above-defined area—there are records of what was probably baïoud as far back as 1877—and that its spread has been limited by factors not yet fully understood.

MAUBLANC (A.) & ROGER (L.). **Une nouvelle rouille du Caféier au Cameroun.** [A new Coffee rust in the Cameroons.]—*Bull. Soc. mycol. Fr.*, l, 2, pp. 193–202, 6 figs., 1934.

The authors state that a careful study of the morphology and symptoms of the coffee rust prevalent in the Cameroons, and especially in the Dschang region, which had been previously erroneously attributed to *Hemileia vastatrix* [*R.A.M.*, xiv, p. 31], showed that it is in reality caused by the fungus which they recently described, in the absence of teleutospores in the material then available, under the name *Uredo coffeicola* [ibid., xiii, p. 507]. Subsequently, however, they received further specimens from the Cameroons, containing teleutospores strongly resembling in shape those of *H. vastatrix* but somewhat larger than the latter (about 20 to 25 μ, as against 18 to 24 by 15 to 18 μ for *H. vastatrix*), and also apparently more abundantly formed in nature. For this reason they refer the Cameroons rust to the genus *Hemileia*, but because of the differences in the symptoms caused by it and in the morphology of the uredo stage [which is again described] and of the teleutospores they distinguish it as a new species under the name *H. coffeicola*.

In a brief note appended to this paper, the authors state that the examination of herbarium specimens in the Paris Museum of *Uredo*

gardeniae thunbergiae P. Henn., a fungus which was referred by Sydow to *H. vastatrix*, leads them to separate it as a distinct species under the name *H. gardeniae thunbergiae* [cf. ibid., xii, p. 169]. Teleutospores were present in abundance and both spore forms are morphologically distinct from those of *H. vastatrix*.

Zaprometoff (N. G.). Гоммоз Хлопчатника и борьба с ним. [Cotton gummosis and its control.]—*Борьба за Хлопок* [*Fight for Cotton*], Tashkent, *1934*, 6–7, pp. 61–70, 4 figs., 1934.

This is a very brief, popular account of cotton gummosis (*Bacterium malvacearum*), based chiefly on Massey's work in the Sudan [*R.A.M.*, xiv, p. 96 *et passim*] and on Stoughton's researches on the organism in England [ibid., xiii, p. 301 *et passim*]. The disease is stated to occur wherever cotton is cultivated in the U.S.S.R., and to be fairly destructive in Central Asia, especially on Egyptian cottons, on which the blackarm form of the disease frequently causes losses up to 60 per cent. or more. While no cotton varieties have been found in Russia to be entirely immune from gummosis, recent data received from Transcaucasia would indicate that locally the 'King-karayazski' No. 915 variety exhibits the greatest relative resistance. Experiments in 1929 showed that the incidence of the disease was reduced from 4·3 to 0·3 per cent. by applications of 300 kg. ammonium nitrate per hectare. Control measures, also based on work done abroad, are briefly discussed.

King (C. J.) & Eaton (E. D.). **Influence of soil moisture on longevity of Cotton-rot sclerotia.**—*J. agric. Res.*, xlix, 9, pp. 793–798, 1 fig., 1 graph, 1934.

Fresh sclerotia of *Phymatotrichum omnivorum* [*R.A.M.*, xiv, p. 166] were buried in unsterilized fine sand (containing at saturation about 27 per cent. moisture on a dry weight basis) in pots and tin containers, series of which were maintained at degrees of moisture varying from air-dry to 28 per cent. Samples of the sclerotia were tested for viability at monthly intervals for a year. All the sclerotia in the air-dry and 5 per cent. series were dead at the end of three months; in the 10 per cent. series, they showed a gradual loss of viability after the first two months, but a few were still capable of germination after 12 months. In the 25 per cent. series a larger proportion were viable at each test than at 10 per cent., but here also the viable percentage rapidly decreased after the ninth month. At 28 per cent. (slightly above saturation) only a few of the sclerotia recovered during the first three months were viable, but from the fourth to the tenth month the percentage of viable sclerotia was usually higher than in any other series; this would suggest that some sclerotia were injured by other organisms. Spontaneous germination and hyphal growth occurred at the highest moistures.

Ezekiel (W. N.) & Taubenhaus (J. J.). **Cotton crop losses from Phymatotrichum omnivorum.**—*J. agric. Res.*, xlix, 9, pp. 843–858, 4 graphs, 1 map, 1934.

While the root rot caused by *Phymatotrichum omnivorum* [see preceding abstract] is believed probably to cause more losses to the cotton crop than any other cotton disease in the United States, the evaluation of

the total reduction in yield due to it is difficult owing to the fact that the affected plants may bear a partial crop, and also because conditions favourable to development of the disease also favour the growth of the host. Determinations made in 1931 at College Station, Texas, in plots of Startex (Texas Station No. 7000) cotton plants grown on artificially infected soil, showed that the number of bolls per plant and the weight of lint and seed both per boll and per plant were all lower in plants that were ultimately killed by the disease than in normal ones, the average weight of lint per plant for the former being 2·37 gm. as against 4·61 gm. for the latter. Plants which had perished two months or more before harvesting bore only an insignificant crop, while those that succumbed five weeks before harvest gave half the normal yield, and those which died during the three weeks immediately preceding picking produced practically a normal crop.

Statistical analysis of field data recorded from 1916 to 1927, inclusive, for two permanent cotton plots at Temple, Texas, which were made by two different methods [details of which are given], indicated that the percentage reductions in yield due to root rot in the different years averaged 1·02 times the recorded percentages of plants killed by the disease. From these investigations two tentative rapid methods are suggested for the estimation of cotton crop losses caused by *P. omnivorum*, by the first of which the estimated percentage reduction in yield is the sum of the percentage of plants killed by root rot seven weeks prior to harvest, plus half of the percentage of plants that died between three and seven weeks before picking. By the second method the estimated percentage reduction in yield is the product of the percentage of plants found killed by root rot at picking time multiplied by a 'loss-estimation ratio'. For use in Texas this ratio has been tentatively determined as 0·9. The application of these methods is illustrated by an estimation of the losses in Texas in 1898, which worked out for the whole State at about 8 per cent., equivalent to a loss of about 444,000 bales.

DUPONT (P. R.). **Work connected with insect pests and fungus diseases.** —*Rep. Dep. Agric. Seychelles, 1933*, p. 5, 1934.

Promising results have been obtained in preliminary tests on the infestation of the Lecaniid scale insects parasitizing coffee, especially *Lecanium viride*, by a virulent strain of *Cephalosporium lecanii* [*R.A.M.*, xiii, pp. 90, 302] of Indian origin supplied by the Imperial Mycological Institute.

MANSOUR (K.). **On the intracellular micro-organisms of some Bostrychid beetles.**—*Quart. J. micr. Sci.*, N.S., lxxvii, 2, pp. 243–253, 2 pl., 1934.

An account is given of the writer's studies at Cairo on the mycetomata found in the beetles *Rhizopertha dominica* F., *Sinoxylon ceratoniae* L., and *Bostrychoplites zickeli* Mars, the first-named a cosmopolitan pest of stored foodstuffs and the two others wood-eaters [cf. *R.A.M.*, xiv, p. 167]. The mycetomata are transmitted from one host generation to the next through the reproductive organs, and remain throughout life entirely isolated from the alimentary tract, so that their alleged

auxiliary role in the digestive processes of the insects may be regarded as open to doubt.

Mansour (K.). **On the so-called symbiotic relationship between Coleopterous insects and intracellular micro-organisms.**—*Quart. J. micr. Sci.*, N.S., lxxvii, 2, pp. 255–271, 2 pl., 1934.

Evidence is adduced in support of the writer's view that the relationship between the intracellular organisms found in certain Coleopterous insects is commensal rather than symbiotic [*R.A.M.*, xiii, p. 440, and preceding abstract]. The following are among the facts on which this conclusion is based. Certain of the woods on which the insects feed have been found to possess a relatively high proportion of available nutrients which can be ingested without external aid. In some cases the micro-organisms only pass into the alimentary tract of the insect during the adult stage when wood ingestion is not in progress, while in others they never enter this region. Similar mycetomata to those commonly associated with wood-eating insects have been found in other groups, e.g., grain pests, in which no question of a symbiotic function arises.

Ninni (C.) & Fittipaldi (C.). **Différence de développement de certaines souches de mycètes blastosporés cultivées sur gélose Sabouraud phéniquée. (Note II).** [A difference in the development of certain strains of blastosporous fungi grown on phenolic Sabouraud's agar.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vi, 11, pp. 443–445, 1934.

When 12 members of the Mycotoruleae, 5 chromogenous and 7 non-chromogenous Torulopsidaceae [*R.A.M.*, xiv, p. 235], and *Saccharomyces cerevisiae* were sown on Sabouraud's medium to which carbolic acid was added at concentrations ranging from 1 in 5,000 to 1 in 1,000 no noteworthy morphological changes occurred, but while the Mycotoruleae grew at the highest acid concentration, the non-chromogenous Torulopsidaceae grew only exceptionally at one of 1 in 2,000 and the chromogenous strains failed to grow at one of 1 in 5,000. A definite correlation was established between the normal reproductive ability of these organisms (which can be verified microscopically after six hours) and that shown in the highest concentrations of acid on the medium used.

Ninni (C.) & Fittipaldi (C.). **Conditions d'infection du cobaye par les mycètes du type Candida. Vitalité réduite de ces mycètes au cours des infections expérimentales. (Note III).** [Conditions of guinea-pig infection by fungi of the *Candida* type. Reduced vitality of these fungi during experimental infections. (Note III).]—*Boll. Sez. ital. Soc. int. Microbiol.*, vi, 12, pp. 469–474, 1934.

In a study of the anatomical and pathological changes induced in guinea-pigs inoculated in different organs with different doses of blastosporous fungi the authors found that four to ten peritoneal inoculations at four-day intervals with a species of *Candida* isolated by themselves and with *C. mycotoruloidea* Redaelli gave consistently positive results at concentrations of 1 part of a culture on agar to 50 to 100 parts of

water, though similar inoculations with an anascosporous yeast from sputum gave negative results. Repeated subcutaneous injections with the authors' *Candida* produced abscesses with a secondary granulomatous reaction, peritoneal inoculations with the same fungus producing a local granuloma after the third injection, visible even when the animals were destroyed two days after this. Guinea-pigs inoculated six times with the authors' *Candida* constantly showed the formation of granulomata in the liver. The same results were given by *C. mycotoruloidea*, but more rapidly. It is concluded that the best means of reproducing specific granulomata lies in making repeated inoculations at intervals of four or six days at a dosage of 1 : 100.

Fungi of the *Candida* type were present in all the organs of the guinea-pigs 15 days after inoculation, and in the spleen 20 days after.

NINNI (C.) & FITTIPALDI (C.). **Allergie et réactions d'hyper-réceptivité et d'immunité au cours des infections expérimentales par les mycètes blastosporés. (Note IV).** [Allergy and hyper-receptivity and immunity reactions in experimental infections with blastosporous fungi. (Note IV).]—*Boll. Sez. ital. Soc. int. Microbiol.*, vi, 12, pp. 414–479, 1934.

After pointing out that in certain subacute or chronic diseases such as tuberculosis and glanders, infection increases the sensibility of the organism, so that any new introduction of the antigen induces an acutely infectious reaction, the authors describe a similar form of allergy in certain fungal infections. When guinea-pigs were given peritoneal inoculations with the species of *Candida* isolated by them, *C. mycotoruloidea* Redaelli, and a non-pathogenic anascosporous yeast [see preceding abstract], those inoculated with the first two showed intradermal reactions to the 'lévurine' (proteid culture extracts) prepared from all three fungi, while the controls and the animals inoculated with the non-pathogenic fungus gave no reaction. The reaction obtained consisted in the production of a papula 1 cm. or more in diameter, usually white at the centre and red at the periphery, appearing 10 to 15 days after the injection and persisting up to the fortieth day or longer.

Guinea-pigs given one large intraperitoneal injection or four small ones of the authors' *Candida* were inoculated in the peritoneum 10 and 30 days later with a 1 : 50 culture of the same organism. Haemorrhage was found to set in in half-an-hour, though control animals that had not received a previous injection did not show this reaction. Further, whereas in the controls the fungus could be found everywhere in the peritoneal cavity, in the previously inoculated animals it was present, half-an-hour later, only in the epiploön. This indicates the existence in the previously inoculated animals of induced resistance resulting in the removal from the cavity by fixation in the epiploön of the subsequently introduced organisms. The intensity of the hypersensitive phenomena, however, tends to mask this induced resistance.

WONG (A.) & KUROTCHKIN (T. J.). **Monilia vulvo-vaginitis.**—*Chin. med. J.*, xlviii, 10, pp. 1058–1065, 1 pl., 1934.

An account is given of the clinical and mycological studies on three cases of vulvo-vaginitis [*R.A.M.*, xii, p. 370] examined at the Peking

Union Medical College. The responsible organism was identified (on a sugar reaction basis) [cf. ibid., xiii, p. 767] in the first two cases as *Monilia* [*Candida*] *pinoyi* and in the third as *M.* [*C.*] *macedoniensis*.

DA FONSECA (O.). **Allergides mycosicas.** [Mycotic allergies.]—Reprinted from *Rev. med.-cirurg. Brazil*, xlii, 9–10, 11 pp., 14 pl., 1934.

This is an historical review of the allergic conditions that have been observed to result from localized infections with dermatophytes and their cure in certain cases by vaccines.

CASTELLANI (A.). **Tinea imbricata (tokelau). A short general account with report of a case in a European.**—*J. trop. Med.* (*Hyg.*), xxxvii, 23, pp. 363–367, 2 col. pl., 1934.

Observations are made on the history, synonymy, geographical distribution, and etiology of tinea imbricata or tokelau, on the classification and cultivation of the fungi implicated in the disorder, and on the medical aspects of the condition, several clinical and etiological varieties of which are recognized [*R.A.M.*, xiv, p. 35]. A brief note is also given on a severe case of long standing in a European, contracted in Arabia.

At least two fungi must be admitted as agents of tinea imbricata, viz., *Trichophyton* (*Endodermophyton*) *tropicale* and *T.* (*E.*) *indicum*, the cultural characters of which are described and compared. *T. tropicale* forms amber-coloured colonies on glucose agar and greyish-white ones on Sabouraud's, plain, and glycerol agars; 'duvet' is absent, except from old cultures on glucose agar. The colonies of *T. indicum* on glucose agar are deep orange to pinkish or red, on the other media white, and 'duvet' is generally present.

CASTELLANI (A.) & JACONO (I.). **Acladiosis and paracladiosis.**—*J. trop. Med.* (*Hyg.*), xxxvii, 23, pp. 360–363, 3 pl. (1 col.), 1934.

The authors recently investigated in a male Chinese a condition closely resembling acladiosis due to *Acladium castellanii* [*R.A.M.*, vii, p. 240] but found on more thorough investigation to be caused by a different organism which was determined as a new variety of *Ascotricha chartarum* Berk. and named var. *orientalis* Cast. & Jacono. Full particulars are given of both diseases, the new one being termed 'paracladiosis'.

A. chartarum var. *orientalis* forms yellowish or brownish colonies, often with superficial spicules, on ordinary media. In glucose broth the mycelium is abundant and composed of septate, branched, anastomosing hyphae, measuring 2·5 to 3·8 μ. Intercalary chlamydospores may be present. Conidiophores are formed from the fifth or sixth day onwards. They are thick, brownish, and bear small bunches of pedunculate (aleuro) conidia, spherical, hyaline to greenish or brownish, and 3 to 4 μ in diameter. Gelatine is liquefied and milk peptonized.

The *Sporotrichum*-like conidia at first pointed to inclusion in that genus, but the examination of cultures by Prof. Curzi led to the detection of asci closely resembling those of *A. chartarum*, a culture of which was subsequently obtained from Berlin. Inoculations with the latter having given negative results on human volunteers, the human pathogen

is believed to be a biologic variety. The conidia of *A. chartarum* are spherical or slightly apiculate, occasionally piriform, 4 to 7 μ in diameter, with a smooth or slightly verrucose surface; the globular or subglobular, very short-necked perithecia are surrounded at the base by large, branched 'hairs', terminating in a large, hyaline, ampulliform cell. These hairs are considered to be conidiophores, some of which terminate in one or more hyaline segments separating as conidia. According to Preuss and Hallier (cited by Rivolta) a fatal mycosis of bees is induced by *A. chartarum*. The asci measure 65 by 11 μ and each contains eight brownish or black ascospores.

KOBAYASI (T.). **Über einen typischen Fall von Sporotrichose.** [On a typical case of sporotrichosis.]—*Jap. J. Derm. Urol.*, xxxvi, 6, pp. 665–676, 6 figs., 1934. [Japanese, with German summary on pp. 114–116.]

From the ulcerous lesions on the back of the left hand and forearm of a Japanese woman the writer isolated a fungus which formed, on Sabouraud's maltose agar at 27° to 31° C., circular, black, glistening colonies, furcate to cerebriform in the centre, smooth towards the periphery, with a greyish-white, radial halo, 2 to 3 mm. broad; on ordinary nutrient agar (4 per cent. maltose) the culture is butter-coloured and a profuse aerial mycelium develops, while on sugar-free agar the colonies are white and stellate. Milk is coagulated and gelatine liquefied. The irregularly septate, straight or slightly curved, hyaline, sporiferous hyphae, averaging 2 μ in width, bear on denticulae (2 by 0·3 to 0·6 μ), singly or in groups or clusters, oval, brown to brownish-black spores, 3 to 6 by 2 to 4 μ. The organism is identified as *Sporotrichum beurmanni* [*R.A.M.*, xiv, p. 168] or possibly a variety of the same. Positive results were obtained in inoculation tests on rats.

LEA (C. H.). **A note on taint production in the fat of chilled beef.**—*J. Soc. chem. Ind., Lond.*, liii, 51, pp. 391T–392T, 1 graph, 1934.

Data are presented showing the correlation between a high free acid content and the occurrence of mould (*Mucor*) spoilage in chilled beef fat [cf. *R.A.M.*, xiii, p. 702]. The tallowy or oily flavour imparted to the fat by protracted storage in atmospheres containing carbon dioxide is not usually considered so objectionable as the taints associated with fungal or bacterial deterioration.

ALLEN (RUTH F.). **A cytological study of heterothallism in Flax rust.**—*J. agric. Res.*, xlix, 9, pp. 765–791, 13 pl., 1934.

This is a detailed account of the author's cytological investigations of heterothallism in flax rust (*Melampsora lini*), some of which have already been noticed from another source [*R.A.M.*, xii, p. 632]. In addition, it is stated that the sporidial germ-tubes enter the epidermal cells of the host, in which each forms a primary hypha of several uninucleate cells; this hypha branches and grows into an intercellular haploid mycelium, the cells of which are one- to four-nucleate. Spermogonia are first formed at the upper and later at the lower surface of the flax leaf; their hyphae are predominantly uninucleate (85 in a count of 100) and mass between the epidermis and the

palisade cells. Paraphyses grow out through a stoma, forming an ostiole [ibid., xii, p. 362] from which the uninucleate spermatia ooze out. Later, the epidermis covering the spermogonium is sloughed off. When placed on the surface of an infected area bearing spermogonia, the spermatia germinate and enter the leaf, probably growing in through the spermogonia, but perhaps also penetrating through epidermal cells; they grow then into an intercellular mycelium, the hyphae of which are at first very slender but later of normal appearance, the indications being that these hyphae obtain food from the sporidial hyphae. Soon afterwards the predominantly uninucleate hyphae of both sexes extend to the epidermis (either upper or lower), abstrict one to four layers of buffer cells, and then fuse by pairs to form 'two-legged' cells; the majority of the fusion cells are binucleate, but deviations and irregularities are common. Each of the fusion cells cuts off terminal binucleate spore initials, each of which again divides repeatedly into the definitive spore and the intercalary cell, giving rise to a chain of spores. The open aecidia begin to shed spores about four days after spermatia are placed on an infection.

GROSSMANN (HELENE). **Untersuchungen über die Welkekrankheit des Flachses.** [Investigations on the wilt disease of Flax.]—*Phytopath. Z.*, vii, 6, pp. 545–583, 3 graphs, 1934.

A detailed, tabulated account is given of the writer's physiological studies at the Federal Technical College, Zürich, on flax wilt (*Fusarium lini* Bolley) [*R.A.M.*, xii, p. 220], of which a highly virulent strain (424), supplied by Prof. Stakman from Minnesota, was used.

Both the susceptible Newland and the resistant Bison variety showed the highest degree of infection at a soil temperature of 27° C.—the optimum for the growth of the host. Bison contracts the disease only when the temperature is raised immediately after germination; seedlings grown at 12° for 15 days are resistant at all temperatures.

The filtrate of a culture of *F. lini* on Richards's or a similar nutrient solution was found, after six weeks' growth of the fungus, to be toxic to flax at a dilution of 1:5, no injurious effect being exerted at this strength by the original medium. The toxin appears to be a chemical substance, neither volatile nor thermolabile, and extractable with methyl alcohol from the vacuum distillation residue of the culture liquid. Like the toxin of *F. lycopersici* [see next abstract], with which it may in fact be identical, the toxic principle of *F. lini* inhibits seed germination. It is not specific in its action, being equally injurious to the resistant Bison as to the susceptible Newland variety, and further causing wilting of *Prunus padus* and *Sorbus* [*Pyrus*] *aucuparia*. The higher the room temperature the more rapid is the course of the wilting caused by the toxin in flax plants.

LUZ (G.). **Über den Stoffwechsel von Fusarium lycopersici und Fusarium lini.** [On the metabolism of *Fusarium lycopersici* and *Fusarium lini*.]—*Phytopath. Z.*, vii, 6, pp. 584–638, 4 figs., 15 graphs, 1934.

A very comprehensive, fully tabulated account is given of the writer's studies at the Federal Technical College, Zürich, on the metabolism of *Fusarium lycopersici* [*R.A.M.*, xii, p. 714] and *F. lini* [see preceding

abstract] grown in pure culture on a modified Richards's solution consisting of 50 gm. glucose, 10 gm. ammonium nitrate, 5 gm. monopotassium phosphate, 2·5 gm. magnesium sulphate, 0·02 gm. iron chloride, and 1 l. distilled water (P_H value 3·9).

Four phases were distinguished in the process of alteration of the reaction of the medium by the fungi during their growth, viz., (1) decline of the P_H value from 3·9 to 3·2; (2) rise to 7·5; (3) fall to about 7·2 or no change; and (4) rise to 8·5. The first phase is associated with the predominance of anions following the formation of organic acids, the second with the selective assimilation by the fungi of nitrate in preference to ammonium nitrogen, the third with the exclusive intake of ammonium, and the fourth with the gradual consumption of organic acids due to incipient sugar shortage. Two periods of development may also be differentiated, the close of the first being marked by a break in the curve of growth and a fall in the ash content coinciding with one in sugar consumption; in the second period the main source of carbon is ethyl alcohol, the chief metabolic product of sugar assimilation. Both volatile and non-volatile organic acids were detected in the cultures, the latter including traces of oxalic and tartaric acids. Albumin compounds were secreted in older cultures.

The most active substances in the causation of tomato wilt by *F. lycopersici* appear to be formed in conjunction with the death of the mycelium and are not direct transformation products of sugar metabolism. A strongly toxic action on the plant was exercised by ammonia, considerable quantities of which were present in the medium during the more alkaline phases of growth. Ethyl alcohol was also toxic at a concentration of 2 per cent.

CALINISAN (M. R.). **Notes on a suspected mosaic of Abacá in the Philippines.**—*Philipp. J. Agric.*, v, 4, pp. 255–257, 1 pl., 1934.

In the course of field observations in 1933 on bunchy top of abacá [*Musa textilis*: *R.A.M.*, xiv, p. 37] in the province of Davao, Philippine Islands, the writer noticed characteristic symptoms suggestive of mosaic disease in a number of plantations.

The conspicuous mottled areas on the leaves consist of yellowish-green, sometimes broken, streaks, involving both surfaces, the midrib, and petiole. The streaks may extend parallel with the veins from the midrib to the leaf margins and in advanced stages the yellowing is pronounced. Mottling may also occur on the unfolded young leaves. From the first appearance of the symptoms (which may be at any stage of growth) each newly formed leaf is similarly affected. Early attacks are followed by more or less severe stunting.

The symptoms of this abacá trouble are similar to those of the virus disease recently reported by Magee from New South Wales [ibid., x, p. 472]. At present the occurrence of the former is sporadic and its effects relatively slight as compared with those of bunchy top and stem rot [see next abstract], but it interferes with the normal growth of the plants and may somewhat reduce the yield. The incidence of infection in different parts of one plantation was found to range from 7·7 to 100 per cent.

Field trials showed that the abacá mosaic is introduced into new plantings and spreads in them by the use of suckers from diseased stools.

The roguing and burning of infected hills have given promising results in preliminary experiments on the control of the disease.

Agati (J. A.), Calinisan (M. R.), & Aldaba (V. C.). **Further studies on the stem-rot of Abacá in the Philippines.**—*Philipp. J. Agric.*, v, 4, pp. 191–211, 10 pl., 1934.

Continuing their studies on stem rot of abacá [*Musa textilis*: *R.A.M.*, xi, p. 300], the writers found the disease assuming a serious aspect in the mountainous districts of Cavite Province, where its occurrence was favoured by prolonged drought; it has also been observed in a milder form in other localities. The Baluñganon and Putian varieties showed the most severe infection (nearly 50 per cent.) in each of the years 1932 and 1933. The causal organism, a species of *Helminthosporium* identified by S. P. Wiltshire as *H. torulosum* [ibid., xiii, p. 787], attacks the leaf sheaths of both abacá and banana (Butuhan, Saba, and Latundan varieties) and the green fruits of the latter (Latundan, Lacatan, and Boñgolan). At an advanced stage of the deep-seated necrosis induced by the fungus the affected stems collapse. Cross-inoculation experiments with *H. torulosum* from banana and abacá gave positive results on both hosts under laboratory, greenhouse, and field conditions. The optimum temperature range for the growth of the fungus was found to lie between 25° and 30° C. It may survive the winter in the dry tissues of its hosts or on refuse in the soil. Suggestions are made for the control of the disease by improved cultural practices.

Severin (H. H. P.). **Experiments with the Aster-yellows virus from several States.**—*Hilgardia*, viii, 10, pp. 305–325, 4 figs., 1934.

Experiments [the results of which are tabulated and discussed] are described in which the virus of aster yellows [*R.A.M.*, xii, p. 446] from New York, Indiana, Wisconsin, and California, as well as that of carrot yellows [ibid., xii, p. 136] from Maine and Idaho, was successfully cross-inoculated by previously non-infective leafhoppers (*Cicadula sexnotata*) to carrots and asters. Celery was highly resistant to the virus from both these hosts from all localities except California. Yellows was similarly transmitted from naturally infected celery from Utah to asters.

Severin (H. H. P.) & Haasis (F. A.). **Transmission of California Aster yellows to Potato by Cicadula divisa.**—*Hilgardia*, viii, 10, pp. 329–335, 4 figs., 1934.

In experiments [which are described, and the results of which are tabulated and discussed] conducted in California to ascertain whether potato plants could be infected with Californian aster yellows [cf. *R.A.M.*, x, p. 734, and preceding abstract] by means of the leafhopper *Cicadula sexnotata*, 50 per cent. of the inoculated plants developed symptoms of the disease, but all attempts to recover the virus from the affected plants gave negative results.

Severin (H. H. P.). **Transmission of California Aster and Celery-yellows virus by three species of leafhoppers.**—*Hilgardia*, viii, 10, pp. 339–361, 1 col. pl., 2 figs., 1934.

Experiments [which are described, and the results of which are tabulated and discussed] on the transmission of Californian aster and

celery yellows [see preceding abstracts] by three species of leafhoppers showed that *Thamnotettix montanus* Van D., which was found to be a natural vector of celery yellows, gave 2·9 and 26·1 per cent. successful transfers of yellows from all sources to asters and celery, respectively. It also caused infection of carrots, White London mustard (a new host), Prickly Winter spinach, Prizehead lettuce, and *Plantago major*.

T. geminatus failed to transmit yellows to healthy asters from naturally infected asters or from asters and celery experimentally infected by *Cicadula sexnotata*. The transmission of yellows from all sources to celery by *T. geminatus* averaged 13·7 per cent. When only a single insect was used the percentage of transmission fell to 2·5. This leafhopper also experimentally transmitted carrot yellows to Short White and White Belgian carrots.

C. sexnotata and *T. montanus* transferred the virus from naturally infected asters to 48·3 and 20 per cent. of healthy celery plants, respectively. In the recovery of the virus from experimentally infected celery in one experiment *C. sexnotata* transferred the virus to 100 per cent. of healthy aster and celery plants, while *T. montanus* failed to transmit it to healthy asters, but transferred it to 44·4 per cent. of healthy celery plants. As both insects failed to separate the viruses of aster and celery yellows, it is considered that only one virus is concerned.

GREEN (D. E.). **Common diseases of the Rose.**—*J. R. hort. Soc.*, lix, 6, pp. 470–476, 4 pl., 1934.

This is a popular account of the symptoms and life-histories of some well-known pathogens of the rose in England, with directions for their control by thorough sanitation and fungicidal treatments. The diseases enumerated are mildew (*Sphaerotheca pannosa*), black spot (*Diplocarpon rosae*) [*R.A.M.*, xi, p. 375; xii, p. 223], cankers due to *Coniothyrium* [*rosarum* and *Leptosphaeria coniothyrium*: ibid., xiii, p. 637], rust (*Phragmidium mucronatum*), crown gall (*Bacterium tumefaciens*) [ibid., xiii, p. 114 *et passim*], *Gnomonia rubi* [ibid., xii, p. 447], hitherto reported only from the Royal Horticultural Society's Garden at Wisley, Surrey, *Botrytis cinerea*, physiological chlorosis, downy mildew (*Peronospora sparsa*) [ibid., xi, pp. 459, 784], and silver leaf [*Stereum purpureum*: ibid., xii, p. 447].

SCHWARZ (F.). **Mehltaubekämpfung bei Rosen.** [Mildew control in Roses.]—*Blumen- u. Pflanzenbau verein. mit Gartenwelt*, xxxviii, 45, p. 569, 1934.

Attention is drawn to the necessity of using the right brand of sulphur for the efficient control of rose mildew [*Sphaerotheca pannosa*]. The best is considered to be 'ground Sicilian sulphur double refined, for vaporization' [*R.A.M.*, xiv, p. 37]; in this form it can also be used for dusting, but it may be obtained in bars. Susceptible varieties should be treated twice weekly and there is no difficulty in keeping them healthy by this method.

RUPPRECHT (G.). **Schwefel und Schwefelverneblung gegen Mehltau.** [Sulphur and sulphur vaporization against mildew.]—*Blumen- u. Pflanzenbau verein. mit Gartenwelt*, xxxviii, 49, pp. 613–614, 1934.

Particulars are given of the construction, application, and costs of the various types of 'sulfurator' apparatus used in Germany for the

control by sulphur vaporization of rose mildew [*Sphaerotheca pannosa*: see preceding abstract] and other fungous diseases of greenhouse plants.

KAWAMURA (E.). **Bacterial leaf spot of Sunflower.**—*Ann. phytopath. Soc. Japan*, iv, 1–2, pp. 25–28, 1934.

The occurrence on [the cucumber-leaved] sunflower (*Helianthus debilis* Nutt.) leaves in the Hukuoka district of Japan of dark brown, green-bordered, coalescent lesions is attributed to a new species of bacterium, *Bacterium helianthi*. The spots are at first minute and water soaked, then expand to 2 or 3 mm. in diameter and darken. Large dead areas may be formed by coalescence, up to 60 or 70 spots per leaf having been observed. The organism measures 1·6 to 2·4 by 1 to 1·4 μ, occurs singly or in short chains, and is motile by means of a single polar flagellum, the length of which frequently exceeds that of the rod. It is Gram-negative; forms round, white colonies on beef agar; peptonizes milk and reduces litmus; does not liquefy gelatine; produces gas from nitrate and acid from saccharose and glycerine without gas; minimum, optimum, and maximum temperatures for growth: below 12°, 27° to 28°, and 35·5° C., respectively, thermal death point 52°. Inoculation experiments with aqueous suspensions of the organism gave positive results on *H. debilis* and [the common sunflower] *H. annuus*.

BARTHELET (J.). **Sur une maladie des Rhododendrons.** [On a disease of Rhododendrons.]—*Rev. Path. vég.*, xxi, 2–3, pp. 31–35, 3 pl., 1934.

Hybrid rhododendrons growing in damp, shady conditions in a nursery in France developed in 1932 a wilt which caused the death of the whole plant. Infection was stated to have apparently occurred through the lower branches, whence it passed to the main stem but remained confined to the parts above the graft. In some cases it started from the terminal buds of the twigs. Isolations from the diseased material yielded a fungus which formed a whitish, pulverulent growth with pyriform, sometimes irregular, sporangia, 28 to 40 by 22 to 26 (average 35 by 25) μ, provided with a wall 0·8 to 1 μ thick and a well-developed papilla. Germination was usually by zoospores, but sometimes on solid media irregular germ-tubes were formed and bore secondary sporangia. Oospores developed later and were spherical, 25 to 30 μ in diameter, and with a wall averaging 2 μ thick. The antheridia, usually from the same hypha as the oogonium, were paragynous but sometimes partly surrounded the oogonial stalk, giving a false impression of amphigynous formation. The oospores germinated by one or more germ-tubes, which in some cases soon produced sporangia. Chlamydospores were also produced and germinated in the same manner as the oospores. The fungus closely resembles *Phytophthora cactorum*, reported on rhododendrons in America [*R.A.M.*, ix, p. 390], except in the somewhat smaller oospores described by Chester in his studies of this species on lilac [ibid., xi, p. 580].

REYES (G. M.). **A sclerotial stem rot of Everlasting, Helichrysum bracteatum Willd.**—*Philipp. J. Agric.*, v, 4, pp. 259–261, 263, 1 pl., 1934.

An account is given of a destructive stem rot and wilt of *Helichrysum*

bracteatum first observed at Manila in 1934 and caused by a species of *Sclerotium* identified on morphological and physiological grounds with *S. rolfsii*. Other Philippine hosts of the fungus include groundnut, rice [*R.A.M.*, vi, p. 371], wheat, onion, and eggplant, various other economic plants, and *Aeginetia indica*, a troublesome phanerogamic parasite of sugar-cane and banana [ibid., ii, p. 109]. Both *H. bracteatum* and *A. indica* are believed to be reported for the first time as hosts of *S. rolfsii*, the control of which by cultural measures is briefly indicated.

NILSSON-LEISSNER (N.). **New host species of the Clover stem rot (Sclerotinia trifoliorum).**—*Bot. Notiser, 1934*, 5–6, pp. 428–436, 3 figs., 1934.

The first part of this paper is a summary of the author's studies (with N. Sylvén) on the life-history, alternate hosts, and other features of the clover stem rot fungus (*Sclerotinia trifoliorum*) in Sweden [*R.A.M.*, viii, p. 793]. In the second part the detection of the sclerotia of the organism on the root system and leaves of a large number of *Geranium dissectum* plants in an alsike clover (*Trifolium hybridum*) field at Svalöf in March, 1934, is briefly described, one *Myosotis arvensis* being similarly affected. Apothecia corresponding in all respects with Frank's description developed on some *G. dissectum* plants transferred to boxes which were placed in the garden for the summer. Inoculation experiments under controlled conditions with these apothecia gave positive results on *T. hybridum*, *T. repens*, *T. pratense*, *G. dissectum*, and *M. arvensis* in pots, and by the middle of October sclerotia had developed on some wilted plants of the first-named host which, with *G. dissectum*, showed the heaviest infection. The occurrence of the clover pathogen on farm weeds of different families is considered largely to explain its longevity in the field.

PITTMAN (H. A.). **Some important fungal diseases of Grape Vines and fruit trees in Western Australia and their control.**—*J. Dep. Agric. W. Aust.*, 2nd Ser., xi, 3, pp. 488–506, 8 figs., 1934.

Short popular notes are given on the symptoms and control of the following plant diseases found in Western Australia, viz., vine powdery mildew (*Uncinula necator*) [*R.A.M.*, xiii, p. 745], vine black spot or anthracnose (*Gloeosporium ampelophagum*) [ibid., xiii, p. 148], peach leaf curl (*Taphrina deformans*) [ibid., xiii, p. 452], shot hole of stone fruits (*Clasterosporium carpophilum*) [ibid., xiii, p. 582], apricot green rot (*Sclerotinia sclerotiorum*) [ibid., xi, p. 157], citrus brown rot (*Phytophthora hibernalis* and *P. citrophthora*) [ibid., xiii, p. 25], stem-end browning or anthracnose of navel oranges (*Colletotrichum gloeosporioides*), pear black spot (*Venturia pirina*) [ibid., xiii, p. 782], and apple powdery mildew (*Podosphaera leucotricha*) [ibid., xiii, p. 522].

RADA (G. G.). **Tres enfermedades del Manzano.** [Three diseases of the Apple.]—*Circ. Estac. exp. agric. La Molina* 25, 21 pp., 11 figs., 1934.

Semi-popular notes are given on the symptoms, etiology, and control of apple scab (*Venturia inaequalis*), powdery mildew (*Podosphaera leucotricha*), and black rot (*Physalospora cydoniae* or *P. malorum*) [(?) *P.*

obtusa: *R.A.M.*, xiii, p. 313]. Scab has been reported from the Rímac Valley but probably occurs also in other parts of Peru. Powdery mildew has been observed in the Lima Valley and at the La Molina Agricultural Experiment Station. Black rot is recorded from the Rímac Valley and the Tacna Department.

CHRISTOFF (A.). **Mosaikkrankheit oder Virus-Chlorose bei Äpfeln. Eine neue Virus-krankheit.** [Mosaic disease or virus chlorosis in Apples. A new virus disease.]—*Phytopath. Z.*, vii, 6, pp. 521–536, 7 figs., 1934.

From 1930 to 1934 the writer investigated a virus disease of apple and other fruit trees (including pear, quince, apricot, peach, and plum) which is stated to be on the increase in nearly all Bulgarian nurseries, causing losses of up to 6 per cent. of the trees. The pale green, polygonal spots are most conspicuous on crab-apples. On grafts the disease commonly assumes the form of chlorosis, accompanied by scorching of the leaf blade and in many cases by complete desiccation. At the same time necrosis sets in at the root tips and involves the phloem of the tap-root and stem. The decayed areas are invaded by secondary parasites or saprophytes which hasten the collapse of the affected tree. Inoculation experiments with a number of these organisms gave negative results, but *Diplòdia pseudodiplodia* (*Physalospora malorum*) [? *P. obtusa*: see preceding abstract] produced symptoms simulating the foregoing; it was, however, definitely ascertained not to be the primary agent of the disease, the virus origin of which is considered to have been established by experiments [some details of which are given] in which apples were budded with buds from trees showing the chlorosis, and in several cases developed typical symptoms of the disease.

Affected trees sometimes gradually recover from the disturbance. Experiments are in progress to determine whether the fruits of mosaic trees contract 'bitter pit' symptoms [ibid., xiv, p. 242].

Of recent years the writer has observed the occurrence of mosaic on a large number of other Rosaceous hosts besides those mentioned above, e.g., almond, cherry (*Prunus cerasus* and *P. avium*), *P. divaricata*, *P. insititia*, *P. mahaleb*, *P. spinosa*, and wild roses. The author states that the virus from rose haws is transmissible to pears and apples, that from plums, quinces, and pears to apples, and that from apples to haws and pears, thus indicating the complexity of the problem.

Control measures should include the destruction of all infected wild material in the nurseries; use of scions from healthy trees; prohibition of apple-planting in heavily infested nurseries; and extermination of aphids and gnawing insects on the trees.

KÜTHE (K.). **Bekämpft die Obstbaumkrankheiten!** [Combat fruit tree diseases!]—*Dtsch. landw. Pr.*, lxi, 51, p. 631, 1 diag., 1934.

Inoculation experiments at the Landsberg (Warthe) Agricultural Experiment Station are stated to have shown that there is a strong tendency to physiologic specialization in the apple scab fungus [*Venturia inaequalis*], monospore cultures of which from a given variety attacked the same variety with particular facility while leaving some others practically untouched [cf. *R.A.M.*, x, p. 464].

Güll (A.). **Ursachen für die wechselnde Anfälligkeit der Obstbäume gegen die Schorfkrankheit (Fusicladium).** [Causes of the variable susceptibility of fruit trees to the scab disease (*Fusicladium*).]—*Obst- u. Gemüseb.*, lxxx, 12, p. 183, 1934.

The necessity is briefly emphasized of selecting apple, pear, and cherry varieties well adapted to withstand *Fusicladium* [*Venturia inaequalis*, *V. pirina*, and *V. cerasi*] in the particular localities where they are to be cultivated [see preceding abstract]. Reaction to these diseases, however, varies considerably with environmental conditions, the reputedly resistant pears, Williams' Bon Chrétien and Charneu Delicious, for instance, being very susceptible to *V. pirina* in the damp climate of the Hamburg district. An instance has been observed in which standard Beauty of Boskoop apples were severely attacked by *V. inaequalis* from which the adjacent espaliers of the same variety remained free, while in another orchard old, dwarf Bonne Louise pear trees were completely healthy in the midst of infected standard trees of the same variety. Soil constitution and the type of stock used are probably important factors in scab development.

Petri (L.). **Degenerazione e necrosi del cambio dei Peri e dei Meli nel Trentino e in Alto Adige.** [Degeneration and necrosis of the cambium of Pear and Apple trees in the Trentino and the Upper Adige.]—*Boll. Staz. Pat. veg., Roma*, N.S., xiv, 3, pp. 281–326, 24 figs., 1934.

The most serious disease of apples and pears (affecting trees 10 to 30 years old) in the provinces of Trento and Bolzano, northern Italy, is a wilt which is becoming more prevalent every year. The first symptoms become noticeable when vegetation is renewed; the blossoms wither and develop necroses, or the young fruits lack turgidity and turn black or drop; the leaves remain small, and are of the 'rosette' type; they are rolled in at the edges, brittle, and sometimes yellowish and deformed. The leaves at the extremities of the branches are generally dead by April, but always remain attached to the twig and are brown, as if killed by cold. The condition never affects all the branches simultaneously, and is confined to the scion, the stock remaining healthy. The roots appear to be unaffected. Affected branches die during the year of attack, or if the necrosis becomes arrested at the base, death ensues the following year. The whole aerial part dies in two or three years or may succumb suddenly. Internally the phloem and cambium are rust- or chestnut-coloured, but the woody cylinder remains free from discoloration.

Histological examination showed the symptoms to be due to degeneration of the cambium and the daughter cells in proximity to it, and the arrest of meristematic activity, this being followed by necrosis of the whole cambial zone and the deeper layers of the phloem. In the early stages there is a disordered cambial activity resulting in an irregular proliferation of a cataplastic tissue of undifferentiated cells, mostly on the phloem side and destined to undergo early necrosis. The pathological condition of the cambium is apparently set up at the branch tips and spreads towards the base, though this requires further investigation.

Though there is a certain resemblance to the action of frost, the cambial proliferation preceding necrosis is rather against this explanation of the injury.

Various fungi and bacteria were isolated from affected material, but their pathogenicity was not established, and the cause of the condition, whose manner of spread suggests that it is infectious, has not yet been ascertained.

The paper concludes with brief suggestions for testing as a means of control the Californian zinc sulphate treatment for little leaf [*R.A.M.*, xiii, p. 39; xiv, p. 176].

Pierstorff (A. L.) & Lamb (H.). **The honeybee in relation to the over-wintering and primary spread of the fire-blight organism.**—*Phytopathology*, xxiv, 12, pp. 1347–1357, 1934.

A tabulated account is given of experiments under controlled conditions in Ohio in 1932–3 to determine the role of honey bees in the over-wintering and primary spread of *Bacillus amylovorus* [*R.A.M.*, xiv, p. 221]. The Yellow Transparent and Grimes Golden Apple varieties were used in the tests.

Though the bees were found to carry the bacteria from artificially inoculated blossom clusters on the lowest branches to others on the same tree, they did not cause blossom infection when hives that had been infested with virulent cultures of the organism were placed under apple trees enclosed within cheese-cloth cages. The transfer of bee colonies, after exposure to heavy infection, from one locality to another did not communicate the disease. The longevity of *B. amylovorus* in pure honey was found to range from 5 to 11 days, but the organism could not be detected on the combs, frames, or in the honey in a beehive 24 hours after inoculation, while it was apparently only present for two days in bees taken from an infested hive. Under local conditions, therefore, the beehive does not seem to constitute a likely source of fireblight inoculum in the spring.

Blight proof Pear trees are uniform.—*Bett. Fruit*, xxix, 6, p. 1934.

In the autumn of 1934 there was planted in southern Oregon a block of 500 young pear trees which is believed to approach more nearly to absolute uniformity and to be more resistant to fireblight [*Bacillus amylovorus*] than any other lot of pear trees in existence. All the stocks were grown from seed from a single tree, fertilized with pollen from one other selected tree, the 500 seedlings grown being selected for uniformity from 2,000 produced. These stocks are from the Old Home variety, the most resistant named variety making vigorous enough growth for experimental purposes. When the main branches have become established the trees will be top-worked to the kind of fruiting varieties desired, such as Bartlett, Anjou, and Bosc. Control of fireblight can then be confined to the bearing wood, with no danger of losing the tree itself.

Cation (D.). **Peach mosaic.**—*Phytopathology*, xxiv, 12, pp. 1380–1381, 1934.

Peach branches received from Colorado in July, 1932, for comparison with the red suture disease occurring in Michigan [*R.A.M.*, xiv, p. 219]

showed no obvious resemblance to the disorder in question. Buds were grafted into a young Hale peach tree at East Lansing, and though all were dead by the close of the season, in the following spring the inoculated tree showed the foliar crinkling and mottling described as characteristic of mosaic [ibid., xiv, p. 222], the symptoms being particularly marked in the leaves developing during a cold spell between 12th and 18th June. Three seedling trees grafted in August, 1933, with buds from the artificially infected Hale and transferred in December to a greenhouse kept at a temperature above 75° F. manifested no mosaic symptoms under these conditions, but the disease developed when the trees were removed to cooler situations. In May, 1934, these trees were placed outside the greenhouse, and again the leaves formed during cool periods showed mosaic symptoms which were not apparent in warm weather. All the other trees inoculated with buds at the same time as the foregoing and left in the field contracted the disease, which thus appears to find maximum expression at a low temperature range.

DUNEGAN (J. C.). **The susceptibility of the peach to artificial inoculations with Bacterium syringae and some allied organisms.**—*Phytopathology*, xxiv, 12, pp. 1378–1379, 1934.

Between 1932 and 1934 the writer conducted inoculation experiments under controlled conditions at the Arkansas Agricultural Experiment Station to determine the pathogenicity to the peach of seven bacterial plant pathogens, namely, two strains of *Bacterium* [*Pseudomonas*] *syringae* from lilac [*R.A.M.*, xiii, pp. 288, 452, 748] isolated, respectively, in Holland and the United States, *Bact.* [*P.*] *prunicola* and *Bact.* [*P.*] *mors-prunorum* from plum (England) [ibid., xiii, pp. 452, 710], *Bact.* [*P.*] *papulans* from Stayman apples (Arkansas), *Bact.* sp. causing target canker of Delicious apples (Virginia) [ibid., xiii, p. 384], and a *Bacterium* found to be the cause of a leaf spot of Italian prunes in Arkansas. Positive results were obtained in every case where aqueous suspensions of the organisms were actually introduced by a hypodermic needle into the leaf and twig tissues, the chloroplasts of which were markedly affected while anthocyanin pigment formation in the adjacent regions was stimulated.

ISAAC (W. E.). **Researches on the chlorosis of deciduous fruit trees. I. Preliminary. II. Experiments on chlorosis of Peach trees.**—*Trans. roy. Soc. S. Afr.*, xxii, 3, pp. 171–204, 1934.

In the first of these two papers the author gives a brief review of the work hitherto done on the causation of chlorosis in plants, with particular reference to previous studies of the condition in deciduous fruit trees in South Africa [cf. *R.A.M.*, xi, p. 724].

The second contains an account of preliminary experiments which were carried out in 1933–4 on Krom River Farm, Elgin, in a plantation of 3,000 young peach trees established in 1933, about 500 of which soon began to exhibit serious chlorosis, the chlorotic trees being mostly but not exclusively grouped together. The results indicated that the condition was curable by soil applications of copper sulphate at doses sufficient to give about 20 p.p.m. of copper in the soil, and also that

applications of potassium sulphate at the rate of 112 lb. per acre, equivalent to about 54 lb. of K_2O, effected a definite improvement. While the condition of the affected peach trees suggests that at least two distinct sets of injurious factors are operative in the soil, the fact that their unhealthy condition was aggravated by applications of lime would indicate that they are not suffering from excess of available aluminium, iron, or manganese. There was no evidence of a deficiency of manganese or magnesium.

TRIFONOVA (VERA). Червени петна по Сливата—**Polystigma rubrum (Pers.) DC.** [The red spot disease of the Plum—*Polystigma rubrum* (Pers.) DC.]—*J. agric. Exp. Sta. Bulg.*, Sofia, v, 11–12, pp. 3–49, 13 figs., 1933. [English summary. Received February, 1935.]

This is the full report of the author's investigation of the red spot disease of plums (*Polystigma rubrum*) in Bulgaria, a comprehensive account of which has already been noticed from another source [*R.A.M.*, xiii, p. 453].

GOIDÀNICH (G.). **Ricerche sul 'deperimento' dei Susini.** [Researches on the Plum 'wilt'.]—*Boll. Staz. Pat. veg., Roma*, N.S., xiv, 3, pp. 339–381, 22 figs., 1934. [English summary.]

A full account is given of further investigations into the wilt (now termed 'non-parasitic leptonecrosis') of Burbank and S. Rosa plum trees recently reported from Italy [*R.A.M.*, xii, p. 769]. In the chronic form of the disease only the middle layers of the phloem are affected during spring and summer, but in the autumn the discoloration almost reaches the cambium; when cambial activity is resumed in the following year new phloem is formed which is only slightly affected. The discoloration may involve a part or the whole circumference of the limb. In fatal termination the necrosis extends through the cambium into the wood. In the acute (and more usual) form conditions are set up in the tree which result in the sudden death of all the aerial organs instead of a single branch, as in the chronic form. The progress of the disease falls into two stages, the first of which shows itself externally as a chlorosis and rolling-up of the leaves and internally as phloem necrosis, while the second (and fatal) stage starts when the wood becomes affected and the leaves wither and die.

A section through the phloem of an affected tree shows that the sieve-tubes, companion cells, and phloem parenchyma are at first rusty-red and later turn black, the discoloration affecting both the cell walls and contents, and being most conspicuous where the cells have become compressed. The medullary rays remain normal, accumulating a considerable quantity of starch. The cambium consists of a few layers of meristematic cells, the transition of which into sieve-tubes takes place immediately. Callus forms very rapidly, sections made in June showing it already present even in unaffected sieve-tube layers near the cambium. The chlorotic leaves contain an excess of starch.

These symptoms indicate some interference with the descending circulatory apparatus affecting the phloem and producing leptonecrosis, the first and most important pathological characteristic of the condition;

this causes the wood to become affected in turn. The phloem necrosis is probably due to a gummy degeneration extending to the cell walls and contents. The discoloration of the wood is accompanied by abundant gum formation which occludes the vessels; that this gum is insoluble in water accounts for the fact that when the active parts of the xylem become affected the leaves wilt.

The condition is provisionally attributed to incompatibility between stock (*Prunus myrobolana* L.) and scion.

Donen (I.). **Studies in deciduous fruit. I. The effect of time of picking on the keeping quality of Plums, with especial reference to the internal browning of the Kelsey Plum.**—*Trans. roy. Soc. S. Afr.*, xxii, 4, pp. 297–311, 1 pl., 2 graphs, 1934.

An account is given of experiments in which Gaviota and Kelsey plums picked at various stages of maturity in four orchards in South Africa, differing in soil, climate, and cultural treatment, were kept in cool storage (34° to 36° F.) for thirty days and subsequently at room temperature for four or twelve days. The results showed that the Gaviota plums that had been picked early developed the least amount of breakdown after storage; this variety should not, however, be kept in store over thirty days, as longer keeping considerably increased the percentage of breakdown. Early-picked Kelsey plums failed to colour in store and showed a high percentage of breakdown, two types of which are distinguished in this variety, namely, internal and invasive browning. The first is characterized by the development of a brown discoloration of the parenchyma immediately around the stone, which slowly spreads outwards until about 75 per cent. of the flesh becomes dark brown, the vascular tissue remaining white and unaffected; this condition is associated with an internal collapse of the flesh, leading, in the worst cases, to a shrivelling of the whole plum. In the second type the browning first appeared as a narrow zone of brown tissue in the flesh near the skin and progressed inward.

All the Kelsey plums, irrespective of time of picking, finally showed internal browning when kept in store for 80 days. It is suggested that this variety should not be stored for periods much over 30 days, and that fruit for export should be picked with 5 to 8 per cent. of coloured surface.

Tomkins (R. G.). **Iodized wraps for the prevention of rotting of fruit.**—*J. Pomol.*, xii, 4, pp. 311–320, 1934.

In tests [which are described and the results of which are tabulated] with iodized paper wrappers for the control of fruit storage rots, wounded oranges inoculated with the spores of *Penicillium digitatum* were wrapped in plain tissue paper or tissue paper treated with a solution of 12·7 gm. iodine, 10 gm. potassium iodide, 200 c.c. water, and 800 c.c. rectified spirit; sheets 50 by 75 cm. readily absorbed 15 c.c. of the solution, this amount being equivalent to 30 mg. of free iodine per wrap 25 cm. square. After 28 days' storage at different temperatures between 5° and 25° C. the samples in the plain and treated wrappers showed, respectively, 5 to 10 and 30 to 55 per cent. sound fruit. When comparable samples of wounded, inoculated oranges were placed in

storage in wrappers impregnated with different amounts of iodine and potassium iodide, the best results were given by the paper treated with 1 per cent. potassium iodide and 1 to 2 per cent. iodine, i.e., that containing approximately 25 to 50 mg. of free iodine per wrap.

Grapes and tomatoes stored in iodized paper wrappers remained free from storage rots and fungal growths for longer periods than when wrapped in untreated paper; thus, Spanish green grapes stored in plain paper wrappers at 42°, 32°, 25°, 18°, and 10° were, respectively, 3, 4, 4, 8, and 30 days in storage before mould growth appeared, whereas the corresponding figures for those in the treated wrappers were 6, 14, 15, 30, and 40 days. After 54 days in storage at 15°, 10°, and 5° green tomatoes in the plain wrappers showed 80, 90, and 100 per cent. rotted fruits, as compared with 20, 0, and 0 per cent. for those in the treated wrappers. The appearance and flavour of the grapes and tomatoes in the treated wrappers remained unimpaired. With apples, plums, and peaches the treated wrappers reduced the amount of rotting, but the treatment adversely affected the appearance and ripening of some varieties.

SMART (HELEN F.). **Micro-organisms surviving the storage period of frozen-pack fruits and vegetables.**—*Phytopathology*, xxiv, 12, pp. 1319–1331, 1934.

Out of some 10,000 containers of frozen fruit and vegetables from three important packing centres in the United States, some 3,000 were subjected from 1929 to 1934 to microbiological analysis for bacteria, yeasts, and moulds, while all were superficially examined for appearance, consistency, flavour, and the like [cf. *R.A.M.*, xiii, p. 796]. Species of the following genera of moulds survived one to three years' storage in sealed containers at 15° F.: *Aspergillus*, *Cladosporium*, *Dematium*, *Oidium*, *Monilia*, *Penicillium*, and *Rhizopus*. Blackberries, figs, and red currants showed a strikingly low incidence of spoilage (average 50 micro-organisms per gm.) as compared, for instance, with cherries (2,250). After a year at 15° the frozen-pack vegetables examined showed a very high microbial content, exceeding 1,000,000 per gm. in some lots of Lima beans [*Phaseolus lunatus*], peas, and spinach (no moulds in the last named). Species of *Penicillium* were extensively represented in beets, Lima beans, mushrooms, and peas; *Rhizopus* in maize and tomatoes; *Aspergillus* in mushrooms and peas; *Cladosporium*, *Dematium*, and *Monilia* in Lima beans; and *Mucor* and a species of *Trichoderma* in mushrooms.

WARDLAW (C. W.). **Diseases of the Banana and of the Manila Hemp plant.**—x+615 pp., 2 col. pl., 280 figs., 15 graphs, London, Macmillan & Co., Ltd., 1935.

In this well-produced and carefully edited book, copiously illustrated with excellent photographic and line or half-tone figures, many of which are original or from his own previously published illustrations, the author has dealt with the chief diseases of banana and the related abacá or Manila hemp (*Musa textilis*) on a scale comparable to that followed in Fawcett's and Lee's classical book on 'Citrus Diseases'. It is, indeed,

probably the most complete work on the diseases of a single tropical crop that has hitherto been attempted, while the range of types of plant diseases covered and the fullness of their treatment will make it a welcome addition to the library of all phytopathologists.

The diseases are grouped under four main headings, viz., (1) soil-borne, vascular, and stem (with three chapters on the wilt or Panama disease of bananas caused by *Fusarium oxysporum cubense*), (2) plantation diseases of the fruit and leaf, (3) virus diseases, and (4) storage disorders of the fruit. The whole subject is considered in the light of the most recent researches and the information presented may be regarded as virtually up to date. Both the technical and purely practical aspects of banana cultivation in relation to disease are very fully treated, so that the requirements of scientists and planters are alike amply covered. There are four appendices, namely, (1) a list of bacteria and fungi associated with the banana as saprophytes and parasites (with synonyms); (2) notes on a cultural and morphological study of six strains of *F. oxysporum cubense*; (3) statistics relating to the importation of bananas into Great Britain; and (4) conditions on shipboard [*R.A.M.*, xii, p. 104]; followed by a most comprehensive bibliography of 559 titles and index.

REYES (G. M.). **Banana black-tip disease in the Philippines.**—*Philipp. J. Agric.*, v, 2, pp. 117–119, 1 pl., 1934.

Attention is drawn to the occurrence on unripe Latundan (or Tordan) bananas in the Philippines of the typical symptoms of the black tip disease due to a fungus agreeing in all respects with *Helminthosporium torulosum* [see above, p. 312].

CHAUDHURI (H.) & SINGH (J.). **Une nouvelle maladie du Grenadier (Punica granatum Linn.).** [A new disease of the Pomegranate (*Punica granatum* Linn.).]—*Bull. Soc. mycol. Fr.*, l, 2, pp. 153–161, 1 pl., 1934.

A brief morphological and cultural account is given of an apparently hitherto undescribed fungus, which was experimentally proved to be the cause of a serious pomegranate disease in the Punjab and North-Western Frontier Province of India. Infection results in a severe die-back of the shoots, the dead and underlying parts of which bear small black pycnidia on their surface; these pycnidia were never found on the fruits on affected trees. The organism is referred to the genus *Pleuroplaconema* established by Petrak in 1923 (*Ann. mycol.*, xxi, p. 300), and is named *P. punicae* n.sp. The hyphae are continuous when young, branched, and 2 μ broad. The pycnidia are formed abundantly both on the natural and on synthetic substrata, and are either carbonaceous or membranaceous according to the medium; they are globular or flask-shaped, and very variable in size (100 to 1,300 μ in culture). The pycnospores are hyaline, unicellular, straight or slightly bent, usually borne singly at the end of branched conidiophores; they measure from 3·48 to 6·33 by 0·63 to 1·9 μ (average 4·42 by 1·26 μ) but may attain 7·02 by 2·03 μ in certain media. Sclerotia are readily formed on maize starch agar and in Richards's medium.

Petroff (A. D.). Химические свойства и методы анализа инсектофунгисидов. [Chemical properties of insecto-fungicides and methods for their analysis.]—128 pp., 11 figs., Госхимтехиздат. [State Chem. Tech. Publ. Office], Leningrad, 1933. [Received February, 1935.]

This small and somewhat elementary text-book is stated to have been compiled for the use of students of practical phytopathology in the U.S.S.R., and gives a brief account of the main chemical properties and chemical constitution of the more common insecticides and fungicides [excluding mercurials] now employed in the Union; it also briefly describes certain methods for the rapid analysis of the preparations and for the estimation of their efficacy.

Faes (H.), Staehelin (M.), & Bovey (P.). **Les ennemis des plantes cultivées. Champignons parasites, insectes nuisibles, accidents, moyens de lutte.** [The enemies of cultivated plants. Parasitic fungi, noxious insects, injuries, control measures.]—381 pp., 4 col. pl., 242 figs., Lausanne, Librairie Payot & Cie., 1934.

This is stated to be the fourth edition of the manual under review, which has been compiled by the well-known Director of the Federal Viticultural and Arboricultural Experiment Station at Lausanne with the aid of two scientific experts on his staff. It is published under the official auspices of the Swiss Association of Agricultural Professors and destined for the use of agricultural students and practicians. The book, which is clearly and copiously illustrated, is divided into two parts, the first dealing briefly and in general terms with the problem of pathogenic invasion (in outline only), parasitic diseases caused by insects and fungi, the control of these organisms, and non-parasitic maladies; and the second and larger portion comprising sections on physiological disturbances, pests, and diseases of the vine and other fruits, and of agricultural and kitchen-garden plants.

Morstatt (H.). **Bibliographie der Pflanzenschutzliteratur: das Jahr 1933.** [Bibliography of plant protection literature for the year 1933.]—*Biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, 316 pp., 1934.

This bibliography of German and foreign literature published during 1933 on various branches of phytopathology has been compiled on the usual lines [*R.A.M.*, xii, p. 775].

Siemaszko (W.). **Zagadnienie sasięgów geograficznych chorób roślin uprawnych.** [The problem of the geographical distribution of the diseases of economic plants.]—*Roczn. Nauk ogrodn.* [*Ann. hort. Sci.*], Warsaw, i, pp. 163–170, 1934. [English summary.]

This brief note represents an attempt by the author to determine, from the data scattered in literature, some of the factors (chiefly climatic) which limit the geographical spread of the parasitic diseases of cultivated plants. As good examples of the controlling effect of the climate on the establishment of a disease newly imported into a country, reference is made to the outbreak in 1927 of potato late blight (*Phytophthora infestans*) and downy mildew of the vine (*Plasmopara viticola*) in

Manitoba, Canada, no further records of which have since been made there. Certain parasites are more or less strictly confined to definite climatic zones, as, for instance, the Peronosporaceae, which appear to be prevalent in regions with an oceanic climate, while the Erysiphaceae seem to prefer continental climates. This may perhaps also explain the striking fact that certain diseases which attack the host plants in the home of their origin, e.g., the potato rusts (*Aecidium cantensis* and *Puccinia pittieriana*) [*R.A.M.*, xi, p. 226] which are very prevalent in South America, have not followed their hosts into their new countries of cultivation.

List of common names of British plant diseases.—95 pp., Cambridge University Press, 1934.

The present revised list of common names of British plant diseases [cf. *R.A.M.*, viii, p. 517] contains seven new hosts and some fifty additional diseases. A number of alterations have been made in the scientific names of the relevant pathogens with a view to securing accuracy and conformity with the International Rules of Botanical Nomenclature. Species of *Fusarium* have been named in accordance with Wollenweber's *Fusarium* Monograph as far as published [ibid., x, p. 626]. Pending the decisions of the International Society for Microbiology, no substantial changes have been made in the names of the bacterial pathogens comprised in the list. The difficulties presented by the inclusion of the common names of tree diseases and their agents have not yet been overcome.

Report on the Third Imperial Mycological Conference, 1934.—32 pp., Imperial Mycological Institute, Kew, Surrey, 1934.

The following were the principal subjects of discussion at the Third Imperial Mycological Conference held in London in September, 1934: work and organization of the Imperial Mycological Institute; administrative measures (including legislation) against plant diseases; methods of standardization of insecticides and fungicides; virus diseases of plants; simplification of control measures for use by small cultivators; foot rot of cereals; and breeding and selection for immunity against disease. Shorter papers were read on the control of turf diseases, effects of drought on potatoes, co-ordination of mycological work in the Empire, root rots of rubber, brown heart of swedes [*R.A.M.*, xiv, p. 70], gumming disease of sugar-cane [*Bacterium vascularum*], and citrus and cotton diseases.

Among the resolutions adopted by the Conference were (1) a proposal for the acceptance throughout the British Empire of a uniform health certificate (the terms of which are defined) to accompany plant exchanges and imports, without prejudice to the rights of importing countries in respect of the prohibition, quarantining, inspection, or treatment of such products as they may deem fit; (2) a recommendation that the transport of living plants by air passengers be prohibited; and (3) the regular circulation by Empire Governments of memoranda regarding current changes in plant protection legislation and the regulations issued thereunder.

Proctor (B. E.). **The microbiology of the upper air. I.**—*Proc. Amer. Acad. Arts Sci.*, lxix, 8, pp. 315–340, 6 figs., 1934.

A detailed, tabulated account is given of the results of 45 aeroplane flights made since 1932 near Boston, Massachusetts, with the object of examining the microflora of the upper air by means of a specially devised collecting apparatus [which is fully described]. The maximum level reached was 20,600 ft.; bacteria and moulds were found above 19,600 and yeasts above 16,000 ft. The examination of 128 mould cultures showed that 57 were species of *Aspergillus*, while 36 belonged to *Penicillium* [cf. *R.A.M.*, xii, p. 371]. Above 9,000 ft. the average number of dust particles captured per exposure was 170·8, the corresponding figures for bacteria and moulds being 1·25 and 0·2, respectively. The length of each exposure varied in different flights from 10 to 35 minutes, the average rate of passage of air through the collector being approximately 1 cu. ft. per minute under general flight conditions.

Petersen (H. E.). **Studies on a parasitic fungus in the Eelgrass, Zostera marina L.**—*Bot. Tidsskr.*, xliii, 1, pp. 1–9, 13 figs., 1934.

The author gives a description of the organism, a species of *Ophiobolus*, which he has found constantly associated with the wasting disease of *Zostera marina* in Danish waters and believes to be the cause of the trouble [*R.A.M.*, xiii, p. 317]. Perithecia form in the late winter to early spring, sometimes also during the summer; they are globular or piriform, $\frac{1}{5}$ to $\frac{1}{4}$ mm. in width, bluish-black, and situated immediately below the epidermis of the host rhizomes. The perithecia contain filiform, acute-ended, non-septate ascospores, about 250 by 2 to 3 μ, formed in non-persistent asci. Leaf infection occurs in the spring by means of the ascospores liberated from the perithecia. The fungus is readily obtainable in pure culture (*Zostera* agar) from the rhizomes, but has only once been isolated from the leaves. It grows somewhat slowly, forming a dense, grey, later reddish-brown mycelial mat, which when placed with a portion of the agar substratum in sea water gives a luxuriant growth in which the formation of perithecia may be initiated. Inoculation tests with mycelial fragments on *Zostera* leaves gave positive results on a limited scale.

The wasting disease has been reported, in Scandinavian waters, from Norway, the Kattegat coasts of Sweden and Denmark, the Limfjord, and the Belts [ibid., xiii, p. 793].

Manil (P.). **De la différenciacion de certains virus phytopathogènes par l'action des complexes.** [On the differentiation of certain phytopathogenic viruses by the action of complexes.]—*C. R. Soc. Biol. Paris*, cxviii, 4, pp. 376–379, 1935.

On 21st January, 1934, the writer inoculated under controlled conditions at Gembloux, Belgium, three young tobacco plants with ordinary tobacco mosaic of local origin [*R.A.M.*, xiv, p. 185], herein referred to as M; three with the mosaic produced in tobacco by inoculation with the juice of 'crinkled' Industrie potatoes (M′) [cf. ibid., xiv, p. 199]; three with K. M. Smith's potato X virus; three with the complex M+X; and three with the complex M′+X, a further three being left

untreated. On 8th March the symptoms presented by the M and M′ series were identical, and they remained so till the close of the experiments in May, with the possible exception of a slight folding of the upper leaves of M′. Two plants of the X series showed a well-defined ring spot, the third remaining healthy. Both M+X and M′+X were affected by mosaic and foliar necrosis in a similar manner, except that in the latter series the mottling was more diffuse and stunting more pronounced (height 5 cm. compared with 6 for M+X and 16 for the controls). On 5th April the comparable figures were 5·5, 10·5, and 27 cm., respectively, and the upper leaves of M′+X were excessively reduced in size. On 5th May the three M′+X plants were dead, while those of the M+X series were healthy and stood 24 to 27 cm. in height. Confirmatory tests were carried out in April with the two complexes with results similar to the foregoing.

It is apparent from these data that the same alien virus (potato X), incorporated with two apparently homogeneous tobacco mosaics, can bring to light far-reaching distinctions between the latter.

Gratia (A.) & Manil (P.). **De quelques échecs de la méthode sérologique appliquée aux virus des plantes.** [On some failures of the serological method applied to plant viruses.]—*C. R. Soc. Biol. Paris*, cxviii, 4, pp. 379–381, 1935.

The writers have as yet been unsuccessful in their attempts to extend the serological method, found effective in the differentiation of tobacco and potato mosaic viruses (X) [see preceding abstract], to the agents of other disorders of known or suspected virus origin, such as those of beet yellowing and mosaic [*R.A.M.*, xiv, p. 72] and the potato leaf roll and virus Y. As regards the question of beet mosaic, this negative outcome would appear to support the view that more than one virus, with divergent antigenic properties, is implicated. In the case of *Melilotus* mosaic [ibid., ix, p. 120; xiii, p. 489], the anti-mosaic serum flocculates indiscriminately mosaic and healthy *Melilotus* and healthy lucerne, so that here again the results are useless from the differential standpoint.

Harley (J. L.). **Some critical experiments upon culture methods used for fungi.**—*New Phytol.*, xxxiii, 5, pp. 372–385, 11 graphs, 1934.

As a result of his cultural experiments with *Neocosmospora vasinfecta* (as representing the group of fungi in which the direction and extent of the change in the P_H value of the substratum caused by growth depends mainly on the nitrogen source) and *Sclerotinia sclerotiorum* (as representing the group in which the change is always towards the acid side and the extent alone of the change depends on the nitrogen source), the author emphasizes the limitations in the technique as used at present in the culture of fungi, due to the effect on the culture medium of the absorption and release of substances by the fungus during its growth. The changes thus brought about are illustrated in respect of the hydrogen-ion concentration with its effect on the composition of the medium.

Attention is also called to the influence of the substances present in

agar, to the effect of heat sterilization, and to the uncontrolled aeration, as invalidating agencies in chemical work in the physiology of fungi.

LUCHETTI (G.). **Comment se comporte le 'Geotrichum javanense, Ver.' dans le lait?** [How does *Geotrichum javanense* Ver. behave in milk?] —*Boll. Sez. ital. Soc. int. Microbiol.*, vi, 12, pp. 490–491, 1934.

After referring to Verona's isolation from a Javanese form of yoghourt of *Geotrichum javanense* Ver. as well as *Bacterium bulgaricum* and *Streptococcus lacticus*, the author states that his investigations demonstrated that the production of alcohol in the beverage was due mainly to the first-named organism and only secondarily to *Bact. bulgaricum*.

DIX (W.). **Ein Beitrag zur Frage des Abbaues der Kartoffel.** [A contribution to the problem of degeneration in the Potato.]—*Landw. Jb.*, lxxx, 5, pp. 769–809, 3 figs., 1934.

A comprehensive, fully tabulated account is given of the writer's experimental studies at the Kiel Agricultural and Plant Breeding Institute on various forms of potato degeneration, from which the conclusion is drawn that these phenomena are due to alcohol formation in the tubers with consequent respiratory disturbance and not, at any rate in the first place, to virus infection [*R.A.M.*, xiv, p. 54].

GIGANTE (R.). **Un caso di elevata recettività per le malattie da virus presentato da piante di Patata provenienti da riproduzione sessuale.** [A case of high susceptibility to virus diseases shown by Potato plants obtained through sexual reproduction.]—*Boll. Staz. Pat. veg., Roma*, N.S., xiv, 3, pp. 334–338, 1934. [English summary.]

In an experimental plot in northern Italy in which, in an attempt to obtain lines resistant to degeneration diseases, imported potatoes had for some years been grown on from true seed, nearly all the plants were affected with leaf roll, crinkle, or various forms of mosaic and necrosis; in another, where asexual reproduction had been practised and tuber selection with the Bianca di Como variety carefully carried out, all diseased plants being systematically removed and burnt, the great majority of the plants were extremely healthy and vigorous, very slight leaf roll but no other virus disease being present. This is considered to show that potatoes sexually reproduced may be highly susceptible to degeneration diseases, and to indicate also that varieties widely grown in Italy for some years may possess inherent resistance, a view supported by the fact that even before selection was practised such varieties long remained practically unaffected. The author suggests that the Bianca di Como variety is congenitally resistant to virus attack, and concludes that the most practical method of combating potato degeneration diseases consists in the preservation and improvement by means of careful tuber selection of the existing resistant varieties.

BAWDEN (F. C.). **Studies on a virus causing foliar necrosis of the Potato.** —*Proc. roy. Soc.*, Ser. B, cxvi, B799, pp. 375–395, 2 pl., 1934.

This is a detailed account of the author's studies of a potato virus (first obtained in 1927 from Murphy under the designation of 'President streak') which is considered not to have been described hitherto, and

for which the provisional name of potato virus 'D' is suggested. In certain varieties (e.g., Arran Chief, Arran Comrade, Arran Victory, British Queen, Edzell Blue, Kerr's Pink, and Sharpe's Express) it produces, when inoculated either by needle or by stem graft, a foliar necrosis, characterized by the appearance 17 to 19 days after inoculation of greyish, soft, and damp interveinal necrotic blotches on the under surfaces of the leaves, giving the latter a wilted aspect; the necroses spread rapidly, coalesce, and ultimately involve the whole leaf, which then falls. The disease advances acropetally in the plant, the severity and extent of the symptoms depending somewhat on environmental conditions and the stage of growth of the host, the growing points of which are never killed. These systemic symptoms are frequently preceded by extremely localized local lesions at the seat of needle inoculations, especially when inoculation is carried out in such a manner that the leaf hairs are broken without materially injuring the epidermis; these lesions appear externally as black necrotic spots penetrating the thickness of the leaf, and are more or less circular, brittle to the touch, and after a time tend to fall out.

The primary symptoms are later followed by a secondary and less severe stage, in which the upper leaves show a pronounced and rather blotchy interveinal mosaic, together with spotty interveinal necroses which may cause acute local deformity; these necroses are hard, black, and brittle, show little tendency to coalesce and remain as isolated patches of dead cells penetrating the thickness of the leaf. In this stage the leaves do not wilt and fall, and any new growth shows only interveinal mottle and the scattered black necroses. Tubers from plants affected with potato virus 'D' are small but apparently healthy and sprout normally; the plants produced by them show symptoms very similar to those of first year infected plants in the secondary stage of the disease; they are much smaller than healthy ones, mature earlier, without any wilting or falling of the foliage, and set only a few small tubers.

Histological examination of leaves of Arran Victory with foliar necroses showed that the necrotic process originates in the parenchymatous cells abutting on the small vascular bundles between the main veins. These cells swell, their cytoplasm becomes abnormally granular and yellow, whilst the walls are thickened by deposits of suberin or cutin; the plastids rapidly degenerate, their breakdown often being the first obvious sign of disease. No intracellular inclusions or 'X' bodies were seen in the large number of preparations studied.

In certain other potato varieties such as, for instance, Duke of York, Epicure, King Edward, Majestic, and Up-to-Date, potato virus 'D' causes top necrosis [acronecrosis: *R.A.M.*, xi, p. 741], while some varieties such as Champion, Di Vernon, and Eclipse were shown to be carriers of the virus; Great Scot and International Kidney may also act as carriers, but their reaction is not constant. The virus was successfully inoculated into tobacco, tomato, *Datura stramonium*, and *Nicotiana glutinosa*, the symptoms on which are briefly described. No insect vector of the virus has as yet been determined.

The paper also contains an account of the purification and of certain of the properties of potato virus 'D' *in vitro*. It is filterable through a

Chamberland L5 candle, is destroyed by heating for 10 minutes at 68° C., withstands ageing in expressed sap for 5 days at 25° and for one week at 1°, is inactivated by 60 per cent. ethyl alcohol, 4 per cent. phenol, and 4 per cent. formalin, all acting for one hour, and is infective at a dilution varying from 1 in 1,000 to 1 in 5,000, according to the species and age of the host plant.

Plants infected with virus 'D' acquire resistance to further infection with potato virus 'X', and vice versa, the extent of the immunity thus acquired depending somewhat on the species and on the rapidity of growth of the host plant. A brief discussion is appended of the possible reasons underlying this acquired resistance, and it is suggested that the two viruses 'X' and 'D' have similar physiological requirements, so that both find it difficult to multiply in the same cell.

Dorojkin (N. D.). Ликвидируем порошистую паршу Картофеля. [Eliminate the powdery scab of Potatoes.]—*На Защиту Урожая* [*Crop Protection*], Moscow, *1934*, 4, pp. 11–12, 1934.

The author states that powdery scab of potatoes [*Spongospora subterranea*] is slowly extending throughout the U.S.S.R., where the disease was previously restricted to comparatively few, widely separated infection foci. Experiments in 1931 and 1933 in White Russia (where powdery scab is stated to be more or less endemic) disproved the prevalent view in Russia of the relative harmlessness of the disease, inasmuch as they showed that potato tubers affected with it are much more liable than healthy ones to various storage rots. Excellent control of powdery scab, common scab [*Actinomyces scabies*], and the storage rots was obtained by disinfecting potato seed tubers in the autumn with meranin (a liquid organic mercury preparation containing less mercury than mercuric chloride but claimed to be considerably more efficacious than the latter), the treatment consisting in dipping the tubers in a 1 in 2,000 meranin solution for 20 to 30 minutes. The treatment did not reduce the viability of tubers which were dipped when sprouted.

Salaman (R. N.) & O'Connor (Cecilia). **A new Potato epidemic in Great Britain.**—*Nature, Lond.*, cxxxiv, 3398, p. 932, 2 figs., 1934.

Early blight of potatoes (*Alternaria solani*), hitherto of relatively slight importance in Great Britain, was observed in 1932, and still more in 1933, to be assuming an epidemic form in the greenhouse and field at Cambridge. In 1934 inoculation experiments were carried out on a large scale both under glass and in the open with positive results. The Kerr's Pink and (to a lesser extent) Edzell Blue varieties were also found in 1934 to be infected by *A. solani* in the potato-growing areas of Ross, Cromarty, and Aberdeen, the north-west coastlands, and the Outer Hebrides: Golden Wonder being apparently immune. In the late autumn of the same year the Majestic and King Edward varieties suffered severely at Cambridge. No evidence was forthcoming of direct injury to the tubers from the attacks of the early blight fungus, but obviously the photosynthetic process must be sensibly impaired by a 25 per cent. reduction in the green leaf area.

TULLIS (E. C.). **Leaf smut of Rice in the United States.**—*Phytopathology*, xxiv, 12, p. 1386, 1934.

Leaf smut of rice (*Entyloma oryzae*) [*R.A.M.*, xiii, p. 416], first reported from the Philippines, has been found in the lower Mississippi Valley. The fungus has recently been cultured in Japan by S. Ito and collaborators from leaf spots formerly attributed to *Sclerotium phyllachoroides* and *Ectostroma oryzae* [ibid., xi, p. 801, where it is incorrectly given as '*Entostroma*']. Specimens of the disease from Japan were found by the writer to be identical with the small, black leaf spot of rice in America, the older lesions of which contained chlamydospores corresponding in all essentials with those of *Entyloma oryzae* as originally described.

TULLIS (E. C.). **Trichoderma sheath spot of Rice.**—*Phytopathology*, xxxiv, 12, pp. 1374–1377, 2 figs., 1934.

A hitherto undescribed sheath spot of rice has been observed since 1929 in Louisiana, Texas, and (more recently) in Arkansas. The lesions, which first appear on the sheaths at about the water line in mid-July, are reddish-brown and measure 2 to 3 by 1 mm.; later they enlarge considerably (up to 10 cm.) and become paler (cream-coloured) towards the centre. Occasionally a definite stripe may develop from the base to the tip of the leaf, apparently in continuation of the sheath infection. The most susceptible varieties (in the order named) are Vintula, Carolina Gold, C.I. 2971, Fortuna, Rexoro, and Blue Rose; as a group, the short-grain varieties show very fair resistance to the new disease, the agent of which is tentatively referred to *Trichoderma lignorum*. Positive results were given in a limited number of greenhouse inoculation tests with the fungus on the Supreme Blue Rose and Carolina Gold varieties. The mycelium occupies the cells and air spaces of the parenchyma of the infected areas and extends into the tracheal tissues.

BEELEY (F.). **Oidium heveae. Report on the 1934 outbreak of Hevea leaf mildew.**—*J. Rubb. Res. Inst. Malaya*, v, 4, pp. 342–350, 1 graph, 1934.

The author gives notes on the occurrence of *Hevea* rubber mildew (*Oidium heveae*) [*R.A.M.*, xiii, pp. 181, 470, 727] during the first five months of 1934 in Malaya. Excessive rains throughout the country in January and February delayed the commencement of wintering, which was slowed up in a very irregular manner by dull, wet weather in March and April, the lack of sunshine also causing the new leaves to remain limp and susceptible for a long time. The growth and spread of the fungus were favoured by the increased humidity, and a mild amount of leaf fall occurred in practically every locality, in many districts for the first time, the chief effect of the fungus hitherto having been exerted on the inflorescence [ibid., xiii, p. 181]. Owing to the inclement weather it was impossible to adhere strictly to the usual sulphur dusting programme, but on six estates the treatments given resulted in an average of 50 per cent. control. The dusted trees did not appear at the time of writing (July) to be likely to give any increase in yield as a result of the applications.

ARAKAWA (S.). **The influence of sugars on the cellulose decomposition by the soil fungi.**—*Trans. Tottori Soc. agric. Sci.*, v, 1, pp. 27–35, 3 figs., 1934. [Japanese, with English summary.]

The author tested the action on cellulose of various fungi isolated from soils and found that *Trichoderma koningi, Aspergillus cellulosae* [*R.A.M.*, xii, p. 593], and some other not fully identified fungi decomposed both filter-paper cellulose and hydrocellulose, while *A. fumigatus*, *A. oryzae*, *Cladosporium herbarum*, and two other species decomposed hydrocellulose only.

Xylose stimulated the decomposition of hydrocellulose by these fungi while glucose and saccharose had no effect. Filter-paper cellulose decomposition by *T. koningi* was stimulated by xylose, xylan, arabinose, glucose, saccharose, and soluble starch, especially the first named. On the other hand these sugars depressed the decomposition effected by *A. cellulosae* to an extent of 30 to 49 per cent. Rhamnose had no effect.

Evidently the process of decomposition is influenced by several factors, including the kind of cellulose, the species of fungi concerned, and the composition of the culture medium in sugars and the like.

BELL (A. F.). **Report of the Division of Entomology and Pathology.**—*Thirty-fourth Rep. Bur. Sug. Exp. Stas Qd*, pp. 50–72, 4 graphs, 1934.

This report for 1933–4 [cf. *R.A.M.*, xiii, p. 324] contains among others the following items of phytopathological interest. Of great practical importance in Queensland was the passage of an amendment to the Sugar Cane Prices Act requiring the publication every year in each mill district of a list of approved cane varieties and the payment of a penalty of ten shillings for the crushing of each ton of cane of any other variety [ibid., xiii, p. 727]. This should lead gradually to the elimination of disease-susceptible varieties.

Owing to success in the control of gumming disease [*Bacterium vascularum*], the most important cane disease in Queensland is now the chlorotic streak that attacks Badila [ibid., xiii, pp. 325, 654], causing 75 to 100 per cent. infection in numerous large areas. In field tests at Meerawa and Feluga, in the wet tropical belt, the yields of chlorotic streak-diseased and healthy Badila cane and of untreated diseased Badila cane and diseased Badila submitted to the warm-water treatment were compared. In the former test the average yields of four healthy and four diseased plots were, respectively, 33·95 and 27·87 tons per acre, representing a mean loss from disease of 17·9 per cent. In the latter test the average yields for the diseased treated and untreated plots were, respectively, 30·43 and 20·71 tons per acre, as against 31·99 tons for the control plots of healthy, untreated cane. The losses in the ratoon crops are as yet undetermined.

A dormant outbreak of *Bact. vascularum* in the Mulgrave area is regarded as serious because of the extreme susceptibility of the seedling S.J. 4, which is otherwise particularly suitable for the poorer soils of this district. In southern Queensland the situation as regards gumming is well in hand; as a result of trials in 1933, Co. 290, P.O.J. 2725, and, to a less extent, P.O.J. 2878 appear to be of outstanding resistance, and

satisfactory resistance was also shown by Co. 290 × S. C. 12/4, P.O.J. 2875 × H.Q. 409, and P.O.J. 2878 × H.Q. 409. The resistance of Q. 813 has been adopted as an approximate standard by comparison with which other varieties are accepted or rejected. On this basis, the resistance of P.O.J. 2722, 2725, 2875, and 2878 is highly satisfactory even under the most rigorous conditions, while P.O.J. 2883 is also satisfactory. The New Guinea canes of the Brandes collection [ibid., xi, p. 265] are unsatisfactory, the only gumming-resistant variety showing deficient vigour.

Leaf scald [*Bact. albilineans*: ibid., xiii, pp. 472, 653] was not much in evidence during the season. There was some evidence that any cross containing N.G. 24 as parent had an unduly large proportion of susceptible progeny.

Further tests again demonstrated the susceptibility of P.O.J. 2878 to downy mildew [*Sclerospora sacchari*: ibid., xii, p. 787; xiii, p. 324], while P.O.J. 2722 also appeared to be very highly susceptible.

Dwarf disease [loc. cit.] was confined to the Homebush area, secondary spread being limited to low-lying fields and parts of fields. Prolonged masking of symptoms was observed in plants from diseased setts of H.Q. 426 and Malagache. Attempts at control by the warm-water treatment of the setts were unsuccessful.

Evidence was obtained that Fiji disease may be spread by adult leafhoppers [*Perkinsiella saccharicida*: ibid., xii, p. 787] as well as by the nymphs, but no transmission resulted from insects fed on diseased canes in the adult stage only.

In the Bundaberg district (where in many fields sugar-cane has been grown for forty years without rotation) the crop growth of certain varieties, especially Q. 813 in the red volcanic soils of Woongarra, has for some time been limited by undetermined factors; preliminary, small-scale tests indicated that indefinable root rots must frequently be a limiting factor in these old lands.

MAIRE (R.). **Champignons africains de la mission Humbert (1928).** [African fungi of the Humbert expedition (1928).]—*Bull. Soc. bot. Fr.*, lxxxi, 7–8, pp. 644–646, 1934.

This annotated list of fungi collected by H. Humbert in Madagascar and equatorial Africa in 1928 includes, among other records, *Corynelia uberata* on living leaves of *Podocarpus madagascariensis* in Madagascar, *Colletomanginia paradoxa* [*Engleromyces goetzei*: *R.A.M.*, iii, p. 444] on living *Arundinaria alpina* in Belgian equatorial Africa, and *Aloysiella deformans* (Pat.) Maire, comb. nov. (*Otthia deformans* Pat.) causing fusiform woody galls on a species of *Philippia* in Madagascar. *C. paradoxa* agreed with the type, which Saccardo erroneously stated was found on *Abies pectinata*, a tree that does not occur in Africa; the fungus is a parasite of bamboos.

RICK (J.). **Polypori riograndenses.** [Polypores of the Rio Grande.]—*Broteria*, iii, 4, pp. 180–189, 1934.

Latin descriptions are given of 29 species of *Polyporus*, including *P. coffeae* [*R.A.M.*, xiii, p. 506], collected by the writer in the Rio Grande Valley, Brazil.

Mosseray (R.). **Les Aspergillus de la section 'niger' Thom & Church.** [The *Aspergilli* of the section '*niger*' Thom & Church.]—*Cellule*, xliii, 2, pp. 201–286, 4 pl. (1 col.), 1934.

On the basis of a comprehensive taxonomic and cultural study the writer has partially revised the classification of the *niger* section of *Aspergillus* proposed by Thom and Church [*R.A.M.*, v, p. 700], creating twenty new species [with Latin diagnoses] and three new combinations.

Mosseray (R.). **Races naturelles et variations de culture chez divers 'Aspergillus'.** [Natural races and cultural variations in some *Aspergilli*.]—*Ann. Soc. sci. Brux.*, liv, pp. 161–189, 1 pl., 17 figs., 1934.

In his studies of the genus *Aspergillus* [see preceding abstract], the writer observed in certain monospore cultures of *A. fuliginosus*, *A. malvaceus*, and *A. japonicus* localized saltations, often consisting in the reduction or suppression of sporulation with a corresponding increase of mycelial development. These mutations remained constant through a large number of subcultures. *A. wentii* produced an albino saltant (var. *alba*), in the shape of a tuft of pure white conidiophores. The mutants developed without apparent cause under normal conditions of artificial culture.

Snyder (W. C.). **Notes on Fusaria of the section Martiella.**—*Zbl. Bakt.*, Abt. 2, xci, 8–10, pp. 163–184, 5 figs., 1934.

A full account is given of the writer's taxonomic studies in California on certain members of the section *Martiella* of the genus *Fusarium*, with special reference to the root-rotting pathogens of peas, beans (*Phaseolus vulgaris*), and potato, namely, *F. solani* var. *martii* f. 2 and f. 3 and *F. solani* var. *eumartii*, respectively. Some saprophytic species of the same group [cf. *R.A.M.*, xiii, p. 594] were included for comparison.

The differences between the strains of the pea and bean root-rotting *Fusaria* in respect of pigmentation of the culture, conidial dimensions, and frequency of septation, which originally appeared to be of specific or varietal rank, were found to be of minor significance as compared with the wide range of characteristics possessed in common by the strains of the two fungi. They are therefore regarded as only forms of *F. solani* var. *martii* and designated f. 2 n.c. (syn. *F. martii* var. *pisi*) and f. 3 n.c. (syn. *F. martii* var. *phaseoli*) [ibid., xiii, p. 668]. Latin diagnoses of the new forms are given. From a pathogenic standpoint there is a close resemblance between the symptoms caused by the three fungi. In each of the hosts the primary symptom is a reddish-brown to dark or nearly black, cortical rot of the underground stem and roots, often followed by secondary wilting.

Bouriquet (G.). **Les maladies du Tabac à Madagascar.** [Tobacco diseases in Madagascar.]—*Ann. de Cryptog. exot.*, vii, 2, pp. 97–112, 4 pl., 1 fig., 1934.

This is a comprehensively annotated list of the diseases that have been so far recorded on tobacco in Madagascar, where the crop is extensively

cultivated in the Itassy (1,600 m. altitude) and in the Tsiribihina valley on the western coast. Powdery mildew (*Erysiphe cichoracearum*) is the chief trouble in the highlands but is very rare in the plain. The leaf spot due to a species of *Alternaria*, considered to be identical with *A. tabacina* (Ell. & Ev.) Hori [*R.A.M.*, x, p. 212], is rather frequent in the lowlands but less important in the Itassy. The same appears also to apply to tobacco mosaic, as well as to 'kroepoek' [leaf curl], Thung's common type of which [ibid., xiii, p. 806] is frequent in the valley, presumably owing to the abundance there of Aleyrodidae spp. which are known in other countries to be vectors of the disease. In 1930 a condition was first observed in the region of lake Itassy (since also found in the valley) which is locally known under the name 'tabac boka' [leprous tobacco] and which is identical with that described from South Africa by Hopkins as 'crinkling' [leaf curl: ibid., xii, p. 58]; while no evidence could be obtained locally that insects are concerned in the distribution of the disease, it is stated that most of the affected plants contained inside their stems one or more larvae of a borer insect, *Phthorimaea operculella*. Diseased buds, however, when grafted on healthy tobacco plants, produced leaves exhibiting typical symptoms of the trouble.

In addition to the above list, isolated cases were observed in the lowlands of virescence of the flowers, a variegation of the leaves without any deformation, a brown felting produced by a species of *Cladosporium* on leaves attacked by Aleyrodidae, and a blight of young plants of bacterial origin, possibly from *Bacillus* [*Bacterium*] *solanacearum*. Control measures are briefly discussed under each disease.

MANDELSON (L. F.). **The importance of Tobacco mosaic.**—*Qd agric. J.*, xlii, 5, pp. 538–545, 3 figs., 1934.

After stating that in Queensland the potential dangers of tobacco mosaic are still imperfectly realized by some growers, the author gives a brief account in popular terms of the symptoms, effects, nature, manner of spread, and control of the disease.

JOHNSON (E. M.). **Dissemination of angular leaf spot of Tobacco by the southern Tobacco worm.**—*Phytopathology*, xxiv, 12, pp. 1381–1383, 1 fig., 1934.

Evidence is briefly adduced of the dissemination of angular leaf spot (*Bacterium angulatum*) of White Burley tobacco in Kentucky [*R.A.M.*, xiv, p. 85] by the larvae of the southern tobacco moth (*Phlegethontius* [*Protoparce*] *sexta*), the organism apparently being carried by the abdominal legs, equipped with semicircular hooks which cause slight leaf injuries. This mode of spread appears to be favoured by conditions leading to dampness of the leaves.

RYAKHOVSKY (N.). „Скручивание листьев" Помидоров в ЦЧО и меры борьбы с ним. ['Leaf roll' of Tomatoes in the Central Tchernozem provinces and its control.]—*На Защиту Урожая* [*Crop Protection*], Moscow, *1934*, 4, pp. 24–25, 1934.

'Leaf roll' of tomatoes is stated to have become very widespread of recent years in the Central Tchernozem provinces of the U.S.S.R.,

surveys in 1933 indicating that from 16 to 97 per cent. of the plantings were infected. The real nature of the trouble has not yet been established, but it is known to have a very depressing effect on the host; field observations in 1932–3 showed that the productivity of 'leaf roll' plants was reduced by 30, 40, and up to 70 per cent. in cases of mild, average, and severe infection, respectively. The fruit from affected plants is strongly ribbed, its taste is impaired, and its weight is reduced by 6 to 23 per cent. Local experiments showed that the disease is chiefly transmitted by seed, and it is recommended that the production of tomato seed in infected regions should be prohibited.

Destructive Insect and Pest Acts, England. The Fruit Tree Pests (Cambridgeshire) Order of 1934. Dated November 26, 1934.—4 pp., 1934.

As from 1st December, 1934, the Local Authority for the Administrative County of Cambridge or the Borough of Cambridge, as the case may be, is authorized on reasonable suspicion to order the inspection and treatment if necessary of any trees, bushes, canes, and plants producing edible fruit for the presence of cankers, brown rots [*Sclerotinia cinerea* and *S. fructigena*], and apple and pear scab [*Venturia inaequalis* and *V. pirina*: cf. *R.A.M.*, xi, p. 80]. The provisions of this Order are to be enforced by the Local Authority.

Similar regulations dated, respectively, 25th January and 9th March, 1935, are prescribed for Kent and Berkshire.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst.*, vi, 8, pp. 164–166, 1934.

U.S.S.R. An Order of the People's Commissariat for Agriculture of 19th May, 1932, regulating the importation of potatoes into the U.S.S.R., prescribes that all consignments of tubers from foreign countries destined for use within or transport through the Union shall be accompanied by a duly authenticated certificate stating that (*a*) no actual or suspected case of wart disease (*Synchytrium endobioticum*) has occurred within a radius of 50 km. from the place of cultivation during the last ten years; and (*b*) the potatoes originate in a district free from powdery scab (*Spongospora subterranea*) or belong to a variety known to be immune from this disease [*R.A.M.*, xii, p. 589].

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Dutch Elm disease quarantine. Notice of Quarantine No. 70.—*U.S. Dep. Agric. Off. Inform. Pr. Serv.*, 3 pp., 1934. [Mimeographed.]

The treatment of European elm veneer logs imported into the United States having proved ineffectual in the extermination of the Scolytid bark beetles implicated in the transmission of *Graphium* [*Ceratostomella*] *ulmi*, Quarantine No. 70 [*R.A.M.*, xiii, p. 64] is amended, as from 1st January, 1935, to prohibit entirely the importation from Europe of all logs of elm and its relatives [a list of which is given] except under special permit from the Secretary of Agriculture.

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SIMMONDS (H. W.) & PARHAM (B. E. V.). **Tomato wilt observations.**—*Agric. J. Fiji*, vii, 1, pp. 21–25, 1934.

After an introductory note by H. W. Simmonds, in which he states that tomato wilt in Fiji is extremely virulent, B. E. V. Parham describes investigations which showed that the commonest form present in the island is due to *Bacterium solanacearum*, though several infections by *Fusarium lycopersici* have recently been observed. Short notes are given on the symptoms of these diseases and the control of the former by seed treatment, soil sterilization, crop rotation, plant sanitation, and the use of resistant varieties.

VANINE (S. I.). Лесная фитопатология. [Forestal phytopathology.]—440 pp., 227 figs., Гослестехиздат [State Forestal Tech. Pub. Office], Leningrad, 1934.

This is a somewhat condensed version of the author's previously published text-books on forest pathology [*R.A.M.*, xiii, p. 405] and the decays of felled and structural timber, which has been officially adopted by the Soviet authorities for use in the Schools of Forestry of the U.S.S.R. The book is well produced and copiously illustrated and should prove a handy and useful text-book for students.

Forest research in India, 1933–1934. Part I. The Forest Research Institute.—92 pp., 1934.

On pp. 24–26 of this report brief notes are given on the progress of the mycological and pathological work under the charge of K. D. Bagchee at the Forest Research Institute, Dehra Dun, India.

On pp. 47–54 an account is given of the work of the wood preservation section under S. Kamesam. The most important achievement during the period under review was the perfecting of the so-called 'ASCU' (arsenic-copper) process [cf. *R.A.M.*, xiv, p. 138]. This is a development of the Falkamesam process [ibid., xiii, p. 284] in which arsenic and copper become fixed in the treated wood, and tests are stated to have shown that a 4 per cent. solution containing 1 part of arsenic to 3 of copper is as effective a wood preservative as undiluted 100 per cent. creosote while costing only about one-sixth as much. An improved and accelerated method of testing wood preservatives has been devised and consists in the use, instead of the ordinary sticks, of rotary-cut veneers,

6 by 1 by $\frac{1}{16}$ in., of a very perishable wood, such as *Bombax malabaricum*, which are treated in an open tank and half-buried in the ground before the onset of the rains.

WELCH (D. S.). **The range and importance of Nectria canker on hardwoods in the northeast.**—*J. For.*, xxxii, 9, pp. 997–1002, 1 fig., 1934.

The most important disease of hardwoods in the north-eastern United States has been found to be the canker caused by *Nectria ditissima* or *galligena* [*R.A.M.*, xiii, p. 732], which was studied by the writer in New York from 1927 to 1933 and in various parts of New England in the latter year. The damage inflicted by the fungus was observed to vary greatly among different stands, in some of which 60 to 80 per cent. of the trees of a particular species may be rendered commercially useless. This occurs, for instance, with red and black oaks [*Quercus rubra* and *Q.* (?) *velutina* Lam.] in Connecticut, yellow and black birch [*Betula lutea* and *B. nigra*] in Vermont, paper birch [*B. alba* var. *papyrifera*] in New Hampshire, and basswood [*Tilia americana*] in New York. The trees are seldom killed outright, the initial lesions being small and extending slowly, often at a rate of under $\frac{1}{2}$ in. per annum. The risk of death by girdling is thus inconsiderable, but the development of an open wound, often directly connected with the heartwood by a dead branch trace, leads to infection by insects and wood-destroying fungi.

Observations showed that abundant fruiting of the *Nectria* on diseased wood in contact with the ground may be expected within a period of 4 to 30 months after cutting. Perithecia containing viable spores have been collected in every month of the year, though their production is most profuse during the spring. Large areas of the trunk may be involved in the saprophytic development of the fungus, which extends for several feet from the canker over the bark. By cutting away the perithecia immediately maturity is reached, three generations of fruiting bodies have been obtained on the same log within 31 months. Comparative morphological and cultural studies and inoculation experiments have shown that the *Nectria* found growing saprophytically is identical with that found sparsely fruiting on active cankers. It is evident, therefore, that the practice of leaving diseased trees on moist ground constitutes a prolific source of infection in adjacent stands.

BEATTIE (R. K.). **Dutch Elm disease found at Norfolk, Virginia.**—*Plant Dis. Reptr.*, xviii, 15, p. 191, 1934. [Mimeographed.]

Further confirmation of the entry into the United States of the agent of Dutch elm disease (*Ceratostomella ulmi*) on imported European burl elm logs for cutting fancy veneer [*R.A.M.*, xiv, p. 203] is furnished by the recent detection of an infected tree near the landing-place for seaborne merchandise at Norfolk, Virginia.

BADOUX (E.). **La rouille corticole du Pin sylvestre à Engelberg.** [The cortical rust of *Pinus sylvestris* at Engelberg.]—*J. for. suisse*, lxxxv, 12, pp. 269–273, 1 pl., 1934.

Attention is drawn to an outbreak of cortical rust, due either to

Peridermium cornui [*Cronartium asclepiadeum*] or *P. pini* [*R.A.M.*, v, p. 197; vi, p. 201; xii, p. 406] on five- to twelve-year-old pines (*Pinus sylvestris*) in a newly afforested area at an altitude of 1,200 m. above sea-level in the Engelberg district of Switzerland. In a stand of 1,288 trees, 137 (11 per cent.) appeared on a recent inspection to be severely attacked, while in 339 (26 per cent.) the rust was confined to the branches. The disease makes rapid progress on young trees in vigorous growth and causes serious damage through the formation of cankers that may eventually girdle and kill the stems and branches. Though one of the alternate hosts, *Vincetoxicum officinale*, of *C. asclepiadeum* is found locally in profusion no rust has been seen on it and it is thus possible that the rust on *P. sylvestris* is *P. pini*, which can infect directly from pine to pine by means of its aecidiospores and is not known to have an alternate host.

Lutz (L.). **Sur les ferments solubles sécrétés par les champignons Hyménomycetes. Cytolyse de la cellulose.** [On the soluble ferments secreted by Hymenomycetous fungi. Cytolysis of cellulose.]—*C. R. Acad. Sci., Paris*, cxcix, 18, pp. 893–894, 1934.

Continuing his studies on the physiology of the lignicolous Hymenomycetes [*R.A.M.*, x, p. 700], the writer found that the decomposition of cotton fibres by *Stereum purpureum* was marked by the following successive stages: cellulose, erythrocellulose (staining red with iodine), xanthocellulose (staining yellow with iodine), insoluble gums, soluble gums, intermediate products between gums and sugar, cellobiose, and monoses (dextrose and levulose).

Dana (B. F.). **Occurrence of curly top in the Pacific Northwest in 1934.**—*Plant Dis. Reptr.*, xviii, 14, pp. 168–173, 1934. [Mimeographed.]

Attention is drawn to the unprecedented spread of curly top in the Pacific Northwest in 1934, following an exceptionally mild winter. Maximum losses of 100 per cent. were recorded on tomatoes [*R.A.M.*, xiv, p. 202], table beets [ibid., xiii, p. 674], Hubbard squashes, Ames Hybrid cucumbers, and pansies. Cantaloupes were severely affected (up to 50 per cent. loss), mangel and pepper [*Capsicum annuum*] crops were reduced to the extent of 10 per cent., while beans [*Phaseolus vulgaris*] suffered a loss of 5 per cent. The occurrence of the disease for the first time in western Oregon points to the migration of the leafhopper vector [*Eutettix tenella*] from its breeding grounds east of the Cascade Range.

Hungerford (C. W.). **Curly top of vegetables in Idaho.**—*Plant Dis. Reptr.*, xviii, 14, pp. 173–174, 1934. [Mimeographed.]

During 1934 the virulence of curly top surpassed all records at the Idaho Experiment Station, where cucumbers were totally destroyed, tomatoes showed up to 85 per cent. infection, and Great Northern × Robust bean [*Phaseolus vulgaris*] crosses up to 10 per cent. [see preceding abstract]. Cucumbers and tomatoes were also very seriously affected near Lewiston, while cantaloupes and squashes were generally attacked. Sugar beets and beans grown commercially in the Twin Falls area suffered heavy damage, the loss for the former being estimated at 100

and for the latter (Great Northern) at 10 to 20 per cent. The production of canning and garden beans was calculated at only some 60 per cent. of the normal, largely on account of curly top. On tomato and squash plantings the losses amounted to about 75 per cent. The extremely mild preceding winter undoubtedly permitted the survival of abnormally large numbers of the insect vector [*Eutettix tenella*].

PALM (B. T.). **Notiser om sydsvenska actinomycoser.** [Notes on south Swedish actinomycoses.]—*Bot. Notiser, 1934*, 5–6, pp. 449–456, 1934. [English summary.]

The writer describes his field observations in south Sweden on the actinomycoses of sugar beets [*R.A.M.*, xiii, p. 288], crucifers (swedes, turnips, and radishes), carrots, and leeks.

In many cases the 'scab' of beets is little more than an external blemish, but where the pathogen spreads to the lateral roots considerable damage may be caused and ingress afforded to various parasitic fungi. In the localities visited beets are frequently preceded by potatoes, and it is therefore reasonable to infer that the same species of *Actinomyces* (*A. scabies*) may be responsible for the disease in both crops. In swedes and turnips the injuries associated with actinomycosis were generally negligible, but on radishes the symptoms were more conspicuous and a certain amount of actual damage was caused, while secondary infections by *Pythium* (?) *artotrogus* [ibid., xi, pp. 91, 331] and *Rhizoctonia* [*Corticium*] *solani* were not uncommon. The species of *Actinomyces* isolated from diseased radishes was found to be capable of infecting sugar beets. The mild infection detected on the upper parts of carrots, immediately below soil level, is thought to be probably due to the same species.

Of considerable interest as an apparently new record is the occurrence of a definitely chromophorous *Actinomyces* on the peripheral living scales of leeks, purchased in a shop at Lund but possibly of Spanish origin. The sunken, greenish-iridescent, sharply defined lesions, up to 0·5 by 0·2 cm. in diameter, formed a marked contrast to the milky-yellow, healthy tissues. The cells of the diseased areas were found to be completely filled by the slender, sparsely branched, yellow hyphae, 1 to 2 μ in diameter.

DAVIS (W. H.). **Alternaria brassicae as a parasite of Chinese Cabbage.**—*Phytopathology*, xxiv, 12, pp. 1379–1380, 1934.

For the past ten years Chinese cabbage (*Brassica pe-tsai* Bailey) [*B. pekinensis* Rupr.] in Massachusetts has been attacked by a form of *Alternaria brassicae* (Berk.) Sacc. [*A. oleracea*: *R.A.M.*, xiii, p. 3] differing slightly in morphological characters [which are briefly described] from the type species but not sufficiently to justify the establishment of a new species or variety. Common cabbage and cauliflower are also liable to infection by the fungus.

SNYDER (W. C.). **Peronospora viciae and internal proliferation in Pea pods.**—*Phytopathology*, xxiv, 12, pp. 1358–1365, 1 fig., 1934.

A common internal symptom in peas infected by *Peronospora viciae* [*R.A.M.*, xiv, pp. 71, 287] in California is stated to be the presence of white, felty patches of epithelial proliferation directly beneath the

yellowish blotches on the exterior of the pod. The delicate, mat-like growth often involves the greater part of the membranous lining, extends $\frac{1}{8}$ in. or more into the cavity, and envelops the ovules. The hair-like outgrowths are several cells long, curling apically and intertwining to produce the dense, felty layer. Immediately below the velvety growth, embedded in the ovary wall, are masses of oospores, the maturation of which imparts a creamy-yellow to brown coloration to the originally white, mealy layer lining the cavity. In pods invaded at an early stage the ovules generally fail to mature, but when they do so the seed coats may be infected by the fungus. The conidial stage of the latter developed on pea plants grown in soil artificially infested with oospores from diseased pods.

WADE (B. L.) & ZAUMEYER (W. J.). **Internal breakdown of Pea seed.** —*Phytopathology*, xxiv, 12, pp. 1384–1386, 1 fig., 1934.

Some 20 per cent. of the Laxtonian pea seed received from Salinas, California, in the spring of 1934 showed spherical, dull light to dark brown lesions, 1 to 5 mm. in diameter, of irregular outline, surrounding the centres. Isolation experiments gave negative results in respect of a pathogenic agent and it is thought that the condition, which was associated with excessive waterings during the ripening period and harvesting in rather cool weather in June, 1933, may be analogous to the 'rotten heart' or 'marsh spot' reported from Holland [and England: *R.A.M.*, xiv, p. 279].

ZAUMEYER (W. J.) & WADE (B. L.). **Physiological spotting of Pea seed.** —*Phytopathology*, xxiv, 12, pp. 1383–1384, 1 fig., 1934.

Attention is drawn to a dark green or nearly black spotting of the seed of Surprise and closely related pea varieties in several American States and in Mexico, resembling that due to *Bacterium pisi* but apparently of purely physiological origin. Both normal and spotted seed may, under certain conditions, produce spotted progeny, and the removal of the blemished seed by hand-picking in some of the canning areas is stated to involve heavy expenditure.

CHRISTOFF (A.). **Einige Versuche über die Bakterienkrankheit bei Bohnen.** [Some experiments on the bacterial disease of Beans.]—*Phytopath. Z.*, vii, 6, pp. 537–544, 2 figs., 1934.

In a test in 1933 on the reaction of five bean [*Phaseolus vulgaris*] varieties to bacterial blight [*Bacterium phaseoli*] in Bulgaria [*R.A.M.*, x, p. 151], severe infection was contracted by the black, white, and yellow sugar-beans and the Mastilen variety, sown between rows of the highly susceptible Flageolet, as well as by the latter itself; only Maitschin proved highly resistant. Further experiments [details of which are given] confirmed the observations of American workers [ibid., vii, p. 430] as to the remedial value of old seed (preferably seven years old), supplemented if necessary by the application of 1 per cent. Bordeaux mixture at the commencement of flowering or on the first signs of infection. Other sanitary practices calculated to ensure the health of the crop are briefly indicated.

TAKIMOTO (S.). **A new anthracnose of Azuki Bean.**—*Ann. phytopath. Soc. Japan*, iv, 1–2, pp. 21–24, 2 figs., 1934.

Azuki beans (*Phaseolus radiatus* var. *aurea*) in the Hukuoka Prefecture, Japan, are stated to suffer from an anthracnose disease, characterized by a reddish-brown spotting of the leaves and attributed to a new species of *Colletotrichum* which is named *C. phaseolorum.* The fungus, which was also found occurring spontaneously on cowpea and was successfully inoculated into kidney beans (*P. vulgaris*), formed black, coriaceous colonies on potato agar and grew best at 30° C., the minimum and maximum temperatures for development being 9° and 36°, respectively. The short conidiophores arise from subepidermal, erumpent acervuli and bear mostly fusiform conidia, 17 to 20 by 3 to 7 μ; the dark brown, uni- to tricellular setae measure 60 to 110 by 3 to 4 μ on *P. radiatus* var. *aurea* and 60 to 120 by 3 to 4 μ on cowpea.

VERPLANCKE (G.). **Étude de propriétés des virus causant les maladies de dégéneréscence de la Betterave.** [A study of the properties of the viruses causing Beet degeneration diseases.]—*Sucr. belge*, liv, 7, pp. 118–127; 8, pp. 142–151; 9, pp. 162–168, 1934–5.

The virus responsible for the 'yellowing' disease of sugar beets and *Beta trigyna* in Belgium [*R.A.M.*, xiv, pp. 209, 327] was experimentally shown to be transmissible from infected to healthy plants by juice inoculations. The disorder is, therefore, evidently of virus and not, as has been suggested, of physiological origin.

The author has carried out more detailed studies on beet mosaic. The thermal death point of the virus was found to lie between 90° and 95° C. It was destroyed by one hour's exposure to 94 per cent. ethyl alcohol, half-an-hour's contact with 5 per cent. formol, 1 per cent. carbolic acid [time not stated], 0·5 per cent. copper sulphate instantaneously, 1 per cent. caustic potash [?] instantaneously, mercuric chloride 1 in 2,000 in 48 hours, oxygenated water in a few minutes; nitric acid (1 in 500) and glycerine produced inactivation of the virus. No diminution of virulence followed the admixture, for 30 minutes or 12 hours, of juice from tobacco, privet, *Solanum capsicastrum*, *S. dulcamara*, *Abutilon thompsoni*, *Phytolacca decandra*, *Clivia nobilis*, *Primula obconica*, *Monstera deliciosa*, or *Pelargonium zonale* with that of mosaic beets. The dilution limit for the virus was 1 in 100,000. Undiluted mosaic juice remained virulent for six days at laboratory temperature and for nine at 12° C. Neither these figures nor those for the thermal death point agree with Miss Hoggan's data [ibid., xii, p. 674], and it may reasonably be deduced from the discrepancies that more than one virus is concerned in the production of beet mosaic.

Using a modification of Vinson's and Petre's purification technique and other methods, the writer obtained a filtrate from which all traces of protein were virtually or definitely absent, pointing in his opinion to the non-living nature of the virus and to its origin in abnormal metabolic processes [cf. ibid., xiii, pp. 329, 475, 588]. The virus traversed a collodion filter with pores of a maximum dimension of 0·6 μ. Comparative inoculation tests with mosaic beetroot juice and purified virus solution at various concentrations up to 1 in 100,000 showed that,

judging by the intensity of the symptoms, the latter withstands dilution better than the former. The infectivity of the purified virus reached a maximum about P_H 7·7.

Injected intravenously into rabbits, the mosaic juice, either in its natural state or inactivated by heating, and diluted with water to the extent of 50 per cent., provoked the formation of a specific antigen.

PALO (M. A.) & FAJARDO (T. G.). **Two destructive leaf diseases of Celery in the Philippines.**—*Philipp. J. Agric.*, v, 2, pp. 31–45, 3 pl., 1 graph, 1934.

A summary is given of the writers' observations on the history, distribution, economic importance, prevalence, symptoms, etiology, and control of the late and early blights of celery (*Septoria apii-graveolentis* and *Cercospora apii*, respectively) [*R.A.M.*, xii, pp. 196, 495, *et passim*]. The losses due to late blight in the Philippines have been estimated at 10 to 20 per cent. of the crop, and to early blight at 8 to 10 per cent. The temperature ranges in the Baguio and Manila districts have been found approximately to correspond with those favouring the development of late and early blight, respectively. Satisfactory control of both diseases has been obtained in Trinidad Valley, Mountain Province, by 4–4–50 Bordeaux mixture applied weekly or 5–5–50 at 10- to 14-day intervals.

FOSTER (A. C.). **Blackheart disease of Celery.**—*Plant Dis. Reptr.*, xviii, 14, pp. 177–185, 1934. [Mimeographed.]

Notes are given on the prevalence in the United States and Canada of blackheart of celery, a physiological disturbance apparently due in the first instance to adverse environmental conditions, such as excessive fluctuations in the soil moisture content and over-plentiful manuring. A baffling feature of the disease is that either extreme humidity or drought may result in an outbreak. Blackheart is sometimes confused with the soft rot caused by members of the *Bacillus carotovorus* group [cf. *R.A.M.*, x, p. 125; xiv, p. 142]. The latter, however, causes total decay of the affected parts, usually without hope of recovery, whereas the former, originating in the heart leaves and producing discoloration of the veins and margins, is frequently outgrown. It is possible that the bacterial infection is secondary to blackheart.

RODIGIN (M.). Новые болезн ибахчевых. [New diseases of Cucurbits.]—*На Защиту Урожая* [*Plant Protection*], Moscow, *1934*, 4, pp. 13–15, 2 figs., 1934.

The author reports that in 1930 watermelons in the lower Volga basin were severely attacked by two diseases not previously observed in the region, and presumably introduced with seed from abroad. They were the wilt due to *Fusarium niveum* [*R.A.M.*, xiv, p. 220], which in 1931 caused considerable losses owing to favourable weather conditions, and a black rot of the fruits, caused by an undetermined species of *Fusarium*. This disease starts usually at the calyx end of the developing melons, as faint, dark, rounded, subcuticular spots, which in dry weather

extend both in area and in depth while in wet weather a pink conidial efflorescence develops on their surface; the vegetative organs of the plants were never seen to be attacked by the fungus. American watermelons appeared to be the most susceptible to this fruit rot, local varieties being more or less resistant and the Melitopol variety, an improved strain of the Bykovskaya Cucurbit Cultivation Station, practically immune. Control measures are briefly discussed under each disease.

Since 1931 vegetable marrows [*Cucurbita pepo*] have been increasingly attacked in storage by anthracnose [*Colletotrichum lagenarium*], infection in some cases being as high as 90 per cent. of the stored fruits. This is stated to be the first record in Russia of *C. lagenarium* on this host.

HIGGINS (B. B.). **Important diseases of Pepper in Georgia.**—*Bull. Ga. Exp. Sta.* 186, 20 pp., 2 col. pl., 6 figs., 1934.

In this bulletin, which is a revised version of the author's previous work on the subject [*R.A.M.*, iii, p. 247], brief, popular notes are given on the symptoms and control of the following diseases of pepper [*Capsicum annuum*] in Georgia: damping-off (*Rhizoctonia* [*Corticium*] *solani*, southern blight (*Sclerotium rolfsii*) [ibid., ix, p. 436], downy mildew (*Peronospora* sp.) [ibid., xiii, p. 602], mosaic, physiological blossom-end rot [ibid., xi, p. 803], internal fruit mould (various mould fungi), leaf spot (*Cercospora capsici*) [ibid., xi, pp. 281, 605], bacterial spot (*Bacterium vesicatorium*) [ibid., iii, p. 119], anthracnose (*Gloeosporium piperatum*) [*Glomerella cingulata*: ibid., xii, p. 724], and ripe rot (*Vermicularia* [*Colletotrichum*] *capsici*) [ibid., x, p. 57; xi, p. 804]. The paper terminates with short, practical recommendations for the control of seed-borne diseases of pepper by means of seed selection and disinfection, sanitation, crop rotation, and spraying.

HIROE (I.) & WATANABE (N.). **Brachysporiose of plants. III. On a new fruit rot disease of Pepper.**—*Trans. Tottori Soc. agric. Sci.*, v, 1, pp. 36–61, 1 pl., 2 figs., 1934. [Japanese, with English summary.]

A tabulated account is given of the writers' studies on a new fruit rot of chilli pepper (*Capsicum annuum*) in the Tottori district of Japan, characterized by subspherical, circular, or irregular lesions, chestnut-brown at first, turning black later. Four fungi are implicated in the etiology of the rot, namely, *Brachysporium tomato* (Ell. et Barth.) Hiroe and Watanabe n.c. (*Helminthosporium tomato*), also found on tomato fruits, *B. ovoideum* n.sp., *B. senegalense* Speg., and *B. capsici* n.sp., Latin diagnoses being given of the new combination and the two new species. In both the latter the conidiophores are erect, simple, slightly flexuous, light brown, 5- to 10-septate, measuring 50 to 400 by 4 to 9 μ, and bearing single acrogenous conidia. The conidia of *B. ovoideum* are ovoid, straight or curved, 1- to 4-, usually 3-septate, rounded at both ends, 16 to 29 by 10 to 17 μ (mostly 20 to 24 by 10 to 13 μ), yellowish-brown, the outermost locules paler. In *B. capsici* they are oblong-fusoid, generally slightly curved, rounded above and pointed below, 1- to 5-, usually 3- to 4-septate, 12 to 49 by 7·4 to 14·5 μ (mostly 29 to 31 by 10 to 12 μ), the outermost locules pale-coloured, the next brown, and the central brownish-black.

Ware (W. M.). **Plaster moulds in Mushroom beds.**—*Gdnrs' Chron.*, xcvi, 2504, pp. 444–445; 2505, pp. 463–465, 3 figs., 1934.

White plaster mould (*Oospora fimicola*) of the cultivated mushroom [*Psalliota campestris* and *P. arvensis*: *R.A.M.*, xiii, p. 213] is believed to have been first observed in England in 1925, but it was not recorded until 1931 [ibid., xi, p. 94]. Of recent years the disease has been common in Sussex and Wiltshire. In fresh material the spores measure 6 to 10 by 4 to 8 μ and vary in shape from oval to globose-oval or globose. These dimensions correspond with those given by Costantin and Matruchot in France and Cuboni and Megliola in Italy, and cultures of the fungus sent to America were found to be identical with the plaster mould occurring in the United States [*R.A.M.*, xiii, p. 7]. Circumstantial evidence indicates that *O. fimicola* is introduced into mushroom beds with the manure. On the outside or in the interior of the bed the mould presents a white powdery aspect resembling that of scattered plaster or lime, and where the compost is kept dry the spores may rise in the air as a light cloud when disturbed. At an advanced stage of maturity the fungal patches turn faintly pink. Once it has gained an entrance into the beds the mould cannot easily be checked or eradicated.

The brown plaster mould described from the United States [loc. cit.] as due to *Myriococcum praecox* Fr. was shortly afterwards found in various parts of England [see next abstract] forming dense white, later cinnamon-brown patches on the beds. Like the foregoing, it is probably introduced on the manure but it succumbs, according to J. F. Styer (Modern Mushroom Culture, West Chester, 1933), to a temperature above 125° F. which is reached on the completion of filling in houses constructed on the tier system. The agent of brown plaster mould is believed to be *Papulaspora byssina* Hots. (*Bot. Gaz.*, lxiv, p. 271, 1917) [this original spelling of the genus name being preferred to that adopted by Saccardo (*Papulospora*): *R.A.M.*, iii, p. 104; vi, p. 212]. It would appear that this organism (originally described from the United States) is identical with that determined on mushrooms in the United States as *M. praecox*. In the English material the typical bulbils are usually spherical or oval, mostly 50 to 230 by 50 to 180 μ, white or cream-coloured at first, later brown, and composed of hexagonal cells, those on the exterior ranging from 6 to 20 μ in diameter while the inner, hyaline ones measure 10 to 24 μ. The hyaline, septate hyphae are 2 to 5 μ (mostly 4 μ) in diameter. On potato-dextrose agar growth is slow, bulbil formation in a deep, fluffy layer covered with a thin hyphal web beginning after about three weeks at 57° F.

Mushroom diseases. Successive stages in Mushroom cultures. Part 3.—*Mushroom News* (W. Darlington & Sons, Ltd., Worthing, Sussex), i, 9, pp. 4–11, 5 figs., 1934.

Notes are given in popular terms on the following diseases or contaminants of cultivated mushrooms [*Psalliota campestris* and *P. arvensis*] in Great Britain and their control: brown plaster mould (*Myriococcum praecox*) [or *Papulaspora byssina:* see preceding abstract], white plaster mould (*Monilia* [*Oospora*] *fimicola*), olive-green mould (*Chaetomium olivaceum*) [*R.A.M.*, vi, p. 296], inky caps (*Coprinus atramentarius*),

green moulds (*Verticillium* and *Penicillium* spp., a species of the former also causing a greyish spot or blotch of the caps), *Xylaria vaporaria*, 'bubble' (*Mycogone perniciosa*), *Cephalosporium costantinii*, *C. lamellaecola*, *Pseudomonas tolaasii* [ibid., xiii, p. 213], 'rose comb', due to coal, mineral, or paraffin oil fumes, *Dactylium dendroides* [ibid., xii, p. 353], and *Fusarium solani*.

The *Verticillium* causing greyish spotting or blotching of the upper cap surface may also be responsible for severe distortions similar to those produced by *M. perniciosa*. In such cases the stalks are swollen or curved and the cap much reduced, while other common symptoms are the presence on the mushroom of a very fine, white 'bloom' and the downward peeling of parts of the stalk. Attacked mushrooms assume a felt-like consistency and may occasionally show white or greyish, sunken, longitudinal streaks on the stalk and white areas on the gills. The causal organism appears to form only one type of thin-walled spore but is probably capable of persisting under adverse conditions by means of its mycelium.

D. dendroides (also reported from the United States and Canada) forms a white, cottony growth round the individual mushrooms, sometimes completely enveloping and destroying them. The fungus is most prevalent on beds where trash, such as old stem butts, broken mushrooms, and the like, is left lying about, and under these conditions it may cause heavy damage. Spraying the beds with formaldehyde (1 part to 9 of water) may be tested as a control measure.

F. solani (identified by Miss E. M. Wakefield and H. W. Wollenweber) was isolated both from Worthing mushrooms and from material received at the Darlington Laboratory for examination. The latter at first sight presented the aspect of infection by fly larvae, the specimens being stunted and brown (though grown from white spawn); eventually they rotted and died off. The fungus grows upwards from the soil into the mushroom stem, obstructing the passage of water and so causing a brown discoloration and wilting. The spores and mycelium of *F. solani* were found to be completely destroyed by 20 minutes' exposure to a temperature of 138° F., so that the use of properly cured manure, which usually reaches a considerably higher temperature, should prevent its introduction with the manure. Steam sterilization of the casing soil should prove effective in houses where the disease has become prevalent, while all traces of infection may be eliminated by spraying the premises with Darlington's mushroom house disinfectant followed by fumigation with 5 lb. flowers of sulphur per 1,000 cu. ft. of air space. The spores of the fungus were found to survive desiccation in the soil for two months.

Ravaz (L.). **Chronique. L'excoriose. Le court-noué et son traitement. Le sulfate de zinc.** [Current events. Excoriosis. Court-noué and its control. Zinc sulphate.]—*Prog. agric. vitic.*, cii, 50, pp. 585–590, 1934.

In view of the fresh outbreak of excoriosis (*Phoma flaccida*) [*R.A.M.*, xiii, p. 679] of the vine in France in 1934, which was undoubtedly caused by the rainy spring of that year, the author recommends that special care should be used by the pruners in selecting the branches destined to replace the old wood on affected stocks. A simple method of determin-

ing whether such branches are infected with the fungus is to section one of the lower dormant buds; if healthy, the sectioned living tissues should be of a pure, fresh green colour, while in infected buds brown spots are visible at the periphery and at the base of the scales, though the bud axis may retain its normal green colour. Some observations indicated than in vines emerging from affected buds the fungus may in certain cases progress through the wood, in addition to its normal advance through the cortex. Such vines may be used as fruit-bearing wood, but should be removed the next season. A direct measure of control may possibly be obtained by spraying the affected vines, as soon as the base of the developing new shoots emerges from the surrounding leaves, with a 4 per cent. Bordeaux mixture, in addition to washing the dormant stocks during winter with a 33 per cent. iron sulphate solution, to which one or two litres of sulphuric acid [per 100 l. solution] is added.

The author recommends grafting vines destined for planting in soils subject to court-noué [ibid., xiv, p. 8] on Riparia or Riparia-Berlandieri stocks, which are resistant to the disease and one of which (422A M.G.) appears to have the property of causing the first basal internodes to elongate. Vine-growers are also advised to co-operate in the official tests that are now being made in France of the curative effect on court-noué of zinc sulphate [ibid., xiv, p. 272], by treating their affected vineyards either by an application of 200 to 250 gm. of the substance per stock, or by washing the pruning wounds with a 20 per cent. solution.

ANTONIADES (P.). **Apoplexy or Vine stroke.**—*Cyprus* (*agric.*) *J.*, xxix, 4, p. 110, 1934.

In the early summer of 1934, when hot weather set in after a cool, rainy period, the non-parasitic form of vine apoplexy [*R.A.M.*, ix, p. 12; x, p. 78] characterized by the wilting and death of the tips of the shoots and leaves suddenly became more prevalent than usual in Cyprus. The disease, which is induced when the vine gives off more water than the absorption of soil moisture can keep pace with, is sporadic, and frequently occurs on land where the subsoil is damp in spring and the water-table falls rapidly in early summer.

Preventive measures consist in improving drainage, uprooting dead vines, and pruning away the diseased parts of partially affected ones, afterwards painting the wound surfaces with tar.

HUGUES (E.) & BOUFFARD (E.). **Le cuivre dans le jus de Raisin.** [Copper in Grape juice.]—*Progr. agric. vitic.*, cii, 52, pp. 639–640, 1934.

The authors state that out of 50 samples of table grapes from vines sprayed (for the most part copiously) with cupric mixtures only one contained as much as 12 mg. of copper per litre of grape wort, the corresponding figure for over four-fifths of the samples being under 5 mg. [cf. *R.A.M.*, xiv, p. 76].

NOBLE (R. J.). **Australia: notes on plant diseases recorded in New South Wales for the year ending 30th June, 1934.**—*Int. Bull. Pl. Prot.*, ix, 1, pp. 2–5, 1935.

The following records of interest are included in this report. Apples

were attacked by *Schizophyllum commune* causing heart rot [*R.A.M.*, xiii, p. 641] and also suffered from measles [ibid., xiii, pp. 218, 384]. Bananas in newly cleared lands suffered from a dry rot due to *Clitocybe* sp. Strawberries were heavily damaged by a wilt caused by *Rhizoctonia* sp. Serious losses in the tomato crops followed infection by bacterial canker (*Aplanobacter michiganense*) and streak, both new records for New South Wales. A rosette disease of undetermined origin was widespread and destructive among sweet potatoes.

HUMPHREY (H. B.) & WOOD (JESSIE I.). **Diseases of plants in the United States in 1933.**—*Plant Dis. Reptr. Suppl.* 86, 107 pp., 12 graphs, 9 maps, 1935. [Mimeographed.]

This report, prepared on the usual lines [*R.A.M.*, xii, p. 493], contains copious and valuable observations on the diseases of cereal, forage, fruit and nut, vegetable, special, and sugar crops, trees, ornamentals, and miscellaneous plants in the United States during 1933. The hot, dry weather which so greatly favoured the extension of *Aplanobacter stewarti* on maize [see below, p. 354], was adverse to the development of glume blotch of wheat (*Septoria nodorum*) [*R.A.M.*, xiii, p. 177], reported from only seven States; Pennsylvania, however, was exceptional in this respect, the disease being present in every field examined.

Sweet clover [*Melilotus alba*] in Kentucky and elsewhere suffered severe damage from a *Pythium*-like fungus [ibid., xi, p. 429]. Infection appears to occur at the ground line, in the tap-root, and sometimes in new shoots.

Black root of strawberries [ibid., xiv, p. 180] was reported from fifteen States, causing losses up to 50 per cent. and constituting a really serious problem in Massachusetts, Arizona, and Maryland.

Limes, grapefruits, King oranges, and lemons were attacked by scab (*Sphaceloma fawcettii*) [or *Sporotrichum citri*] in Florida [ibid., xii, p. 495], the loss on grapefruits, the most important host, amounting to 5 per cent. Oranges in southern Louisiana and Satsumas [*Citrus nobilis* var. *unshiu*] in Mississippi were infected by the same fungus.

Downy mildew (*Peronospora* sp.) of tobacco [ibid., xiii, p. 602] was much more widespread in Maryland than in the preceding two years.

Puccinia schedonardi was collected on cotton in Oklahoma, this being the first record of rust on that host in the State.

Sheath rot of sugar-cane (*Cytospora sacchari*) [ibid., xiii, p. 728] was reported to have spread rapidly from about 15th May to 1st August at Houma Field Station, Louisiana, retarding or preventing tiller development in susceptible varieties. Among the more promising seedlings undergoing tests for commercial value the incidence of infection ranged from 3 to 38 per cent., with indications of appreciable economic losses under certain conditions in C[anal] P[oint] 28/19 and 29/320. All the commercial varieties were attacked except Co. 290 but never to a larger extent than 5 per cent.

A map facing p. 70 shows the distribution of white pine (*Pinus strobus*) and blister rust (*Cronartium ribicola*) throughout the Union in 1933 [ibid., xiv, p. 220].

Aiding West Virginia agriculture through research.—*Rep. W. Va. agric. Exp. Sta. for the biennium ending June 30, 1934* (*Bull.* 263), 44 pp., 17 figs., 1934.

The following are some items of phytopathological interest in this report, other than those already noticed.

A bark disease of apples, 'black pox', previously regarded as a form of 'measles' [see preceding page and below, p. 372], due to a hitherto unidentified fungus now named *Helminthosporium papulosum*, is of considerable importance in a few restricted localities, and on one occasion was present on fruits of the Grimes variety.

Evidence was obtained that the failure of wilt-resistant watermelon varieties in the Ohio valley was due to the occurrence of strains of *Fusarium niveum* [*R.A.M.*, xiii, p. 143, and above, p. 343] differing in their ability to cause wilting of any particular variety; some strains frequently produced new ones, which also varied in virulence.

Certain red cedar [*Juniperus virginiana*] varieties are naturally resistant to rust [*Gymnosporangium juniperi-virginianae*: ibid., xiii, pp. 311; xiv, p. 150], and grafted trees from rust-free parents when exposed to heavy infection remained unaffected. These resistant types should be suitable for planting in apple-growing areas.

Instant Bordeaux mixture [ibid., xi, p. 587; xii, pp. 240, 654] prepared from pulverized copper sulphate and superfine chemical hydrated lime gave considerably higher suspensions than Bordeaux mixture from stock solutions of copper sulphate and quicklime, which it equalled in toxic properties.

Aamodt (O. S.). **Breeding cereal varieties for northern regions.**—*Proc. fifth Pacif. Sci. Congr., Canada, 1933*, pp. 1729–1739, 5 figs., 1934. [Received February, 1935.]

After stating that fundamental studies on the factors influencing cereal yields are greatly needed and pointing out that in the attempt to improve cereal crops, instead of breeding for such general characteristics as yield and quality it would be more effective to determine the particular characteristics on which yield and quality depend, the author briefly indicates the methods and scope of the cereal breeding work carried out at the University of Alberta, where studies are being made of resistance to cold (with artificial refrigeration) and drought, the milling and baking qualities of different wheats, straw strength and 'shattering', and disease problems. The paper concludes with a plea for better co-ordination in research work and the setting up of unified objectives, especially in regard to work done for the M.Sc. and Ph.D. degrees of Canadian universities.

Aamodt (O. S.). **The relation between physiologic forms of phytopathogenic fungi and the problem of breeding for resistance to disease.**—*Proc. fifth Pacif. Sci. Congr., Canada, 1933*, pp. 2615–2625, 1934. [Received February, 1935.]

After referring to the importance in plant breeding problems of physiologic specialization in fungi the author discusses with numerous references to the relevant literature the nature of this specialization as

it affects wheat diseases in Canada, and the inheritance in wheat of reaction to infection by the different physiologic forms. Practically all the points dealt with have already been noticed from other sources [cf. *R.A.M.*, xii, pp. 14, 208, 428].

Levine (M. N.) & Stakman (E. C.). **Uniform rust nurseries indicate decreasing severity of stem rust.**—Abs. in *Phytopathology*, xxv, 1, p. 25, 1935.

A consistent decrease in the incidence of stem [black] rust [*Puccinia graminis*: see next abstract] on wheat and oats during the past 15 years is stated to be apparent from observations on uniform rust nurseries in different parts of the United States. Among the factors contributing to this result may be the abnormally low rainfall of the last few years, the eradication of some 20,000,000 barberry bushes [cf. *R.A.M.*, xiv, p. 219], and the increasing use of resistant wheat and oat varieties.

Stakman (E. C.), Hines (L.), Cassell (R. C.), & Levine (M. N.). **Population trends of physiologic forms of Puccinia graminis tritici, 1930 to 1934.**—Abs. in *Phytopathology*, xxv, 1, p. 34, 1935.

Striking changes are stated to have been observed between 1930 and 1934 in the relative prevalence of physiologic forms of *Puccinia graminis* on wheat in Mexico and the United States [*R.A.M.*, xii, p. 427; xiii, p. 753]. Form 56, for instance, constituting only 0·2 per cent. of all rust collections in 1930, was present in over 30 per cent. in 1934, the corresponding figures for form 34 being 0·7 and 20 per cent., respectively. A gradual increase of form 139 also appears to be taking place. On the other hand, the prevalence of form 38 declined from an average of 34 per cent. for 1930–33 to under 4 per cent. in 1934. It is considered significant that the ratios of forms to isolations in 1934 were about 1:3 and 1:33, respectively, for the 29 aecidial and 700 uredo collections tested.

Ramsbottom (J.). **L. G. Windt and heteroecism.**—*Trans. Brit. mycol. Soc.*, xix, 2, pp. 128–138, 1935.

In this paper the author gives excerpts from a book by L. G. Windt which was published in Germany in 1804, and which appears to be very rare, since he could trace only one copy of it (in the British Museum) in Great Britain, and since the only reference to it in readily accessible works is in Klebahn's *Die wirtswechselnden Rostpilze*, pp. 210–13. The book gives a detailed account, in the form of a diary, of Windt's observations and researches which contributed in a large measure to establish the part played by barberry in the perpetuation and distribution in Germany of black rust of cereals (*Puccinia graminis*).

Young (P. A.). **A new variety of Tilletia tritici in Montana.**—Abs. in *Phytopathology*, xxv, 1, p. 40, 1935.

Three years' investigation of a form of bunt affecting 25 to 95 (average 49) per cent. of the heads in a 200-acre stand of untreated Turkey wheat in Montana in 1931 showed it to be a new variety of *Tilletia tritici*, characterized by conspicuously reticulate chlamydospores, 13 to 18 μ in diameter, which rarely germinate in water at 12° or 25° C. Most of the bunt balls were of a hard, solid consistency instead

of soft and powdery as usual. The diseased plants were very much dwarfed and tillered with abnormal profusion. Soil infestation with the new form [*R.A.M.*, xii, p. 429] caused 0·2 to 4·9 per cent. of infection in three winter wheat varieties, while seed inoculation produced nearly 1 per cent. in five others.

BOCKMANN (H.). **Bekämpfung der Weizenfusskrankheiten.** [Control of the Wheat foot rots.]—*Dtsch. landw. Pr.*, lxi, 50, pp. 615–616, 1934.

In the Kiel district of Germany the blackleg form of foot rot of wheat, due to *Ophiobolus graminis*, occurs chiefly on soils of moderate or poor quality, following barley and to a lesser extent wheat and rye. It may be lessened by appropriate crop rotation, liberal applications of humus to the soil in the form of organic (not mineral) manure, deep ploughing to induce 'mellowness' and promote the movement of soil moisture, and late sowing. Lodging of wheat, due to *Cercosporella herpotrichoides* [*R.A.M.*, xiv, p. 230], predominates on good soils, following stubble fallow, peas, vetches, and beans [*Vicia faba*], and to a lesser extent clover with summer fallow. It can be checked by measures tending to prevent over-luxuriant autumn growth, e.g., a sparing use of organic material, stable manure being preferably applied to the preceding crop rather than to the wheat itself, and late sowing.

WEIGERT (J.) & WEIZEL (H.). **Ertrags- und Güteminderung bei Getreide durch Fusskrankheiten.** [Yield and quality depreciation in cereals through foot rots.]—*Prakt. Bl. Pflanzenb.*, xii, 10, pp. 289–303, 7 figs., 1935.

The writer's continued investigations [the results of which are fully tabulated and described] on the effects of the foot rots caused by *Ophiobolus graminis*, *Cercosporella* [*herpotrichoides*: see preceding abstract], and *Fusarium* spp. on cereals in Bavaria [*R.A.M.*, xiii, p. 432] generally confirmed those previously obtained in respect of the deleterious influence of a preceding wheat or barley crop on the incidence of infection, whereas potatoes, lucerne, oats, field beans [*Vicia faba*], and flax reduced the disease. Spring wheat was if anything more severely affected than the autumn sowings. Under otherwise identical conditions *O. graminis* was much less prevalent on wheat growing in a considerable depth of black earth than on that in shallow vegetable mould. The detrimental effects of the foot rots on tillering, haulm development, and ear formation were clearly shown and are statistically evaluated.

ÅKERMAN (Å.), GRANHALL (I.), & HAGANDER (H.). **Undersökningar över olika förfrukters inverkan a Veteskörden, särskilt med hänsyn till angrep av rotdödare (Ophiobolus graminis).** [Investigations on the influence of different preceding crops on the Wheat harvest, especially with reference to the attack of the root-killer (*Ophiobolus graminis*).]—*Sverig. Utsädesfören. Tidskr.*, xliv, *1934*, 6, pp. 386–408, 1935. [German summary.]

A series of experiments was conducted at Svalöf from 1928 to 1934 to determine the influence of different preceding crops on the size and

quality of the wheat harvest, with special reference to the incidence of foot rot caused by *Ophiobolus graminis*, *O. herpotrichus*, and *Hendersonia herpotricha* [*R.A.M.*, xiii, p. 297, and preceding abstracts], of which the first-named appears to be the most injurious in Sweden.

Winter wheat (Svalöfs Kronen) was planted every other year alternating in different plots with Victory and Gopher oats, Gold and Brio barley, Donnerstag peas, a green fodder mixture, and fallow. The best yield was given in the two last-mentioned series; wheat following peas yielded rather less and that following oats and barley was the worst. In the three years in which *O. graminis* was a limiting factor in production, a higher yield, more straw, and superior quality of grain was obtained from wheat following oats than where barley was the forerunner. Precipitation and temperature relations were found to exert a marked effect on the incidence of foot rot, which occurred in a virulent form (1927 to 1929, inclusive) following an abnormally heavy rainfall in May and June; on the other hand, the disease has been virtually absent in the last few, exceptionally dry seasons. The stimulating influence of insufficiently rotted stable manure on the development of *O. graminis* was clearly demonstrated in 1933. Some experiments to determine whether there were any well-marked differences in resistance to the diseases amongst different wheat varieties gave negative results.

Moore (M. B.) & Allison (C. C.). **The distribution of intermediate types of Barley smuts.**—Abs. in *Phytopathology*, xxv, 1, p. 28, 1935.

Seed from some 700 samples of Minnesota barley and 125 from other States was sown in 1934, and the smutted heads, appearing in about half the plots, were examined for head type and colour of spore mass. The character of the spore wall and type of chlamydospore germination were also determined. Smutted heads collected in barley fields were similarly inspected. It was found that, besides *Ustilago hordei* and *U. nuda*, *U. medians* is widespread from North Carolina to Colorado and from Missouri to Minnesota. More than one kind of smut often occurred in the same sample, occasionally two in the same head. *U. nuda* and *U. medians* were not differentiable by head type or colour of spore mass. The heads infected by *U. nuda* fell into at least two colour groups.

Allison (C. C.). **Hybridization between Ustilago hordei and U. medians.**—Abs. in *Phytopathology*, xxv, 1, p. 5, 1935.

Intra- and interspecific combinations of monosporidial lines of *Ustilago hordei* [*R.A.M.*, xiii, p. 691] and *U. medians* [see preceding abstract] were tested on six barley varieties. The pathogenicity of the crosses was similar to that of one or other of the parents, except on the Peatland variety (no smut as compared with 9 per cent. for combined lines of *U. medians*). All the F_2 dicaryophytes resulting from four combinations of F_1 monosporidial lines of a *U. hordei* × *U. medians* cross were distinct in their pathogenicity to the six barley varieties. Two were more pathogenic to Velvet than the F_1 dicaryophytes or either of the intraspecific combinations. In the F_1 the head type was intermediate and the chlamydospores echinulate. In the F_2 segregation occurred for compact, loose, and intermediate head types and for smooth and echinulate chlamydospores. Indications were also obtained of the independent

segregation of the factors governing sex, pathogenicity, head type, and chlamydospore wall characters.

Moore (M. B.) & Allison (C. C.). **An albino strain of Barley smut.**—Abs. in *Phytopathology*, xxv, 1, pp. 27–28, 1935.

In the summer of 1934 a single barley head infected by a strain of *Ustilago hordei* of albino appearance was detected at University Farm, St. Paul, Minnesota. The head was almost white and presented an aspect intermediate between that of loose and covered smut. The hyaline spores were smooth, rather smaller than those of typical *U. hordei*, and produced promycelia and sporidia on germination. Sporidial fusions between monosporidial lines indicate the occurrence of two sex groups in the albino strain that are compatible with those of normal *U. hordei* and *U. medians* [see preceding abstracts].

Christensen (J. J.) & Graham (T. W.). **Physiologic specialization and variation in Helminthosporium gramineum Rab.**—*Tech. Bull. Minn. agric. Exp. Sta.* 95, 40 pp., 11 figs., 6 graphs, 1934.

In a detailed study of several hundred monospore isolations of *Helminthosporium gramineum* obtained from the United States, Canada, and Germany over 125 races were distinguished in culture by the nature, amount, and colour of the mycelium, production of pigments in the substratum, zonation, tendency to produce 'patch' variants, and rate of growth. Races similar to each other on one medium sometimes differed completely on another. Association with bacteria stimulated growth and induced pigment production in certain races only; the staling products of the bacteria exerted differential effects on mycelial development among the races. The races varied in their tolerance to ultra-violet rays, exposure to which failed to stimulate fructification or induce the production of variants. Some were stable, others very unstable. The evidence indicated that certain races may produce variants on the living host, the conidial progeny obtained from a barley plant inoculated with one race falling into ten cultural groups. There were, as between the various races, significant differences in the length, width, and number of septa of the conidia and profound differences in virulence. In general, Svansota, Manchuria, Minsturdi, Peatland, and Velvet were the most susceptible of the barley varieties tested, but none was completely susceptible to every race. Lion, Glabron, and Wisconsin No. 38 were moderately resistant, and Black Hull-less, Spartan and Trebi more so. As certain races are relatively innocuous to certain varieties of barley while very pathogenic to others, much caution is necessary in drawing final conclusions from varietal resistance tests.

Murphy (H. C.). **Effect of crown rust on yield, water economy, and composition of Oats.**—Abs. in *Phytopathology*, xxv, 1, pp. 28–29, 1935.

Crown rust of oats [*Puccinia lolii*: *R.A.M.*, xiv, p. 220], initiated in the seedling and boot stages [in Iowa], entirely suppressed grain production in the susceptible Markton variety and reduced the yield of the resistant Victoria by 47·5 and 30·8 per cent., respectively. Anthesis-stage infection reduced the Markton and Victoria yields by

45·3 and 18·3 per cent., respectively. No appreciable reduction followed attack at the late dough stage. Green, diseased plants of Markton, Iogold (susceptible), Victoria, and Bond (nearly immune) showed an increase in percentage content of insoluble solids, soluble and insoluble ash and nitrogen, and acid-hydrolysable substances, and a decrease in soluble solids, sucrose, glucose, levulose (94·7 per cent. in Markton), and dextrin.

Ivanoff (S. S.). **Inoculation tests with Phytomonas stewarti and P. vasculara.**—Abs. in *Phytopathology*, xxv, 1, p. 21, 1935.

Young sorghum plants inoculated in the greenhouse through basal punctures with *Phytomonas* [*Aplanobacter*] *stewarti* [*R.A.M.*, xiv, p. 160], developed red stripes along the leaf veins similar to those produced by the same pathogen on maize. Field inoculations on sorghum caused reddening and plugging of the vascular bundles, with occasional formation of pith-like cavities. Red leaf stripes developed on Sudan grass (*Holcus sudanensis*) [*Andropogon sorghum* var. *sudanensis*] inoculated in the field. On yellow foxtail (*Setaria glauca*) the stripes resulting from inoculation with *Aplanobacter stewarti* were narrow and tan-coloured.

Maize (sweet corn) plants inoculated at the base in the greenhouse with *P. vasculara* [*Bacterium vascularum*] developed symptoms resembling those induced in the same host by *A. stewarti*, such as water-soaked stripes on the leaves, stalk rot, and general stunting. Puncture inoculations of sorghum plants with *Bact. vascularum* produced foliar symptoms comparable to those associated with this organism on sugarcane and with *A. stewarti* on sorghum.

Ivanoff (S. S.) & Riker (A. J.). **Resistance of Sweet Corn to bacterial wilt.**—Abs. in *Phytopathology*, xxv, 1, pp. 21–22, 1935.

During the summers of 1933 and 1934 tests of resistance to bacterial wilt (*Phytomonas* [*Aplanobacter*] *stewarti* [see preceding abstract] were conducted on over 200,000 maize (sweet corn) plants, including some 2,000 Golden Bantam inbreds and hybrids [*R.A.M.*, xiv, p. 151]. The scope of the experiments and the uniformity and efficiency of inoculation with five pathogenic strains of the organism were greatly enhanced by the use of a plant inoculator [ibid., xiii, p. 390]. No immune plants were found but there were considerable differences in susceptibility, resistance being apparently correlated with both innate and acquired vigour, time of maturation, and 'true resistance'. In general, late strains were more resistant than early ones, but true resistance was found in both weak and vigorous, early and late strains. Crosses between susceptible and susceptible inbreds commonly yielded susceptible hybrids, whereas those between susceptible or resistant and resistant inbreds gave resistant hybrids.

Garber (R. J.) & Hoover (M. M.). **Influence of Corn smut and hail damage on the yield of certain first-generation hybrids between synthetic varieties.**—*J. Amer. Soc. Agron.*, xxvii, 1, pp. 38–45, 1935.

Statistics for 1932–3 are presented supporting the conclusions of previous experiments in West Virginia as to the reduction in maize yields associated with sterility induced by smut (*Ustilago zeae*) [*R.A.M.*,

vii, p. 780; xii, p. 365 and next abstract]. Early-maturing varieties appeared to be more susceptible to this form of injury than late ones. Contrary to expectation, the smut boils situated above the ear and at the neck caused more damage than those below the ear at the base [cf. ibid., xi, p. 447].

Stakman (E. C.), Tyler (L. J.), Hafstad (G. E.), & Sharvelle (E. G.). **Experiments on physiologic specialization and nature of variation in Ustilago zeae.**—Abs. in *Phytopathology*, xxv, 1, p. 34, 1935.

Physiologic specialization appears from the results of three years' inoculation experiments with ten collections of *Ustilago zeae* on six maize varieties to be relatively unimportant from the standpoint of breeding for resistance to smut [*R.A.M.*, xii, p. 365]. Sectoring did not generally decrease to any extent even in lines derived from the thirteenth successive sporidium and did not appear to result from delayed segregation [ibid., xiii, p. 226]. The genotypical determination of sectoring is shown by the fact that segregation, cultural and sexual, on a promycelium was of the 1, 2; 3, 4 type, and in 89 colonies of 49 monosporidial lines from sporidia 3 and 4 there were 360 sectors, while none developed in about the same number of colonies from sporidial lines 1 and 2. There were eight types of segregation in eleven chlamydospores from a certain cross, including three that apparently remained diploid.

Koehler (B.). **Pathologic significance of seed-coat injury in Dent Corn.**—Abs. in *Phytopathology*, xxv, 1, p. 24, 1935.

A slight puncture in the seed coat at the crown caused a 12 to 16 per cent. loss in the grain yield of maize plants [in Illinois], while a corresponding reduction of 18 to 23 per cent. followed the removal of the seed coat from the whole crown. Field inoculation tests showed that, under wet soil conditions, *Aspergillus flavus* and *A. tamarii* [*R.A.M.*, xii, p. 47] caused heavy damage to maize with seed coats injured at the crown, producing virescent seedlings, many of which died from chlorophyll deficiency. *Gibberella saubinetii* proved virulent only in dry soils, notably in plots planted with seed injured at the crown. *Penicillium oxalicum* [ibid., xiii, p. 572] was also much more active in both wet and dry soils on injured than on sound seed-grain. A seed treatment with ethyl mercury phosphate [ibid., xiii, p. 157] practically prevented all reduction in stand or yield from seed coat injury.

Johann (Helen). **Diplodia macrospora on Corn in Brazil.**—*Plant Dis. Reptr.*, xix, 1, pp. 9–10, 1935. [Mimeographed.]

The occurrence of *Diplodia macrospora* [*R.A.M.*, xiii, p. 746] on the rotted kernels of an unnamed white maize variety in San Paulo, Brazil, is briefly reported.

Okabe (N.). **Bacterial diseases of plants occurring in Formosa. IV.**—*J. Soc. trop. Agric. Taiwan*, vi, pp. 54–63, 3 figs., 1934.

Italian millet (*Setaria italica*) in Formosa is liable to a disease termed bacterial brown stripe, characterized by the presence on the leaves of long, narrow, dark or clove-brown streaks, 0·2 to 0·7 mm. in length, sometimes confluent, mostly on the lower side of the midrib, extending

in severe cases to the leaf sheath, occasionally accompanied by a malodorous top rot of the central shoot, and rarely involving the young stalks.

Full details are given of the cultural, morphological, and physiological characters of the causal organism, to which the name of *Bacterium setariae* n.sp. is given. It is a Gram-negative, non-acid-fast rod with rounded ends, occurring singly, in pairs, or in short chains, 1·8 to 4·4 by 0·4 to 0·8 μ in diameter, uni- or occasionally biflagellate, forming white, opalescent, circular, convex, smooth, glistening colonies on beef extract agar, slowly liquefying gelatine and clearing milk, producing indol and ammonia, strongly reducing nitrates, forming acid from dextrose, galactose, and glycerine, and growing moderately well in Uschinsky's, Fermi's, and Fraenkel's solutions; the minimum, optimum, and maximum temperatures for development are above 5°, 31° to 34°, and 42° C., respectively, and the thermal death point 55° to 56°; vitality is retained for over four months in culture and five days' desiccation resisted. The organism was shown by inoculation experiments to be pathogenic to *S. italica* and less severely to oats, wheat, and maize (very mild).

SCURTI (F.) & PAVARINO (G. L.). **Sopra le erosioni ocracee che compaiono sulla buccia delle Arance sanguine refrigerate. (Contributo allo studio della cosidetta oleocellosi.)** [On the ochraceous lesions appearing on the skin of blood Oranges in cold storage. (A contribution to the study of the so-called oleocellosis).]—*Ann. Sper. agr.*, xv, pp. 7–13, 2 col. pl., 1934.

After stating that blood oranges (*Citrus aurantium sanguineum*) constitute 10 per cent. of the total exports of oranges from Italy the author describes an experiment in which sterilized and unsterilized blood oranges in different types of containers were placed in storage at 4° to 5° C. After fifteen days a high percentage showed a condition resembling oleocellosis [*R.A.M.*, ix, p. 450; xiv, p. 234], ochraceous-yellow, later dark spots appearing on the skin round the calyx and gradually spreading, affecting the epicarp and sometimes the mesocarp beneath. Further examination indicated that the condition was due to the cold storage interfering with the liberation of the essential oil, the low temperature preventing it from volatilizing, with the result that, as the skin lost its elasticity owing to the cold, the essential oil exuded through ruptures into the surrounding tissues, which it corroded. Fruit placed in ordinary storage after being picked in cold, wet weather is liable to a less severe form of the same condition.

PAVARINO (G. L.). **Batteriosi delle erosioni ocracee delle Arance ovali.** [Bacteriosis of the ochraceous lesions on oval Oranges.]—*Ann. Sper. agr.*, xv, pp. 15–17, 2 col. pl., 1934.

After pointing out that ordinary oval oranges subjected to cold storage are also liable to develop, though to a less extent, the ochraceous-yellow spotting observed on blood oranges [see preceding abstract], the author states that bacteria enter the spots, penetrate to the oil glands, and increase the alteration of the tissues. The organism most commonly present was identified as *Bacillus mesentericus vulgatus* [*R.A.M.*, xii, p. 109].

Bunting (G.), Georgi (C. D. V.), & Milsum (J. N.). **The Oil Palm in Malaya.**—ix+293 pp., 36 pl., 2 graphs, 4 plans, Department of Agriculture S.S. and F.M.S. (Malayan Planting Manual No. 1), 1934.

This well-produced and copiously illustrated book replaces the bulletin on *Elaeis guineensis* published under the same title in 1927 [cf. *R.A.M.*, vii, p. 164], and is the first of a new series of Malayan planting manuals. In the chapter on oil palm pests and diseases, the mycological part of which (pp. 57–71) is by A. Thompson, notes are given on the symptoms and control of stem rot (*Fomes noxius*) [ibid., xiii, p. 215], *F. lignosus* [ibid., xi, p. 769], bacterial bud rot [ibid., xii, p. 354], crown disease [loc. cit.], and the fruit bunch disease caused by *Marasmius palmivorus* [ibid., xii, p. 355]. Reference is also made to a bunch-end rot and a fruit rot, probably both of physiological origin [cf. ibid., xiv, p. 31], to stem-base rot associated with *Ustulina zonata*, and to lightning injury.

Maublanc (A.) & Roger (L.). **La phthiriose du Caféier au Cameroun.** [Phthiriosis of Coffee in the Cameroons.]—*Rev. Bot. appl.*, xv, 161, pp. 25–32, 1 fig., 1935.

The authors describe in some detail the points of similarity between the specimens labelled *Polyporus coffeae* Wakef. on coffee roots received by them [*R.A.M.*, xiv, p. 333] from the Cameroons and that of vine roots affected with phthiriosis associated with *Bornetina corium* and a coccid in Palestine [ibid., xiii, p. 506], with particular reference to the close morphological resemblance of the conidia of the fungi in both cases. All the evidence indicates that the Cameroon coffee fungus is not parasitic on the roots but develops on the exuded sap resulting from the insect punctures and on the sugary excreta of the latter, forming impermeable, rubber-like sheaths around the roots which are thus asphyxiated. The condition is stated to be especially prevalent in the Dschang region, where it causes serious losses. The genetic connexion between the conidia which Miss Wakefield considered to belong to *P. coffeae* and the sporophores of the latter has never been proved, and the authors consider it to be doubtful. They, therefore, refer this form to the genus *Bornetina*, leaving the question of its specific identity with *B. corium* provisionally open. Like the *Polyporus* it is doubtless a saprophyte.

Progress Reports from Experiment Stations, season 1933-1934.—viii+152 pp., 24 graphs, 1 plan, London, Empire Cotton Growing Corporation, 1935.

This compilation of reports for 1933 from the various stations of the Empire Cotton Growing Corporation [cf. *R.A.M.*, xiii, p. 368] contains the following items of phytopathological interest, apart from those already noticed from other sources [ibid., xiv, pp. 96–98].

Experiments at Barberton, South Africa, on the insect transmission of internal boll disease (*Nematospora gossypii* and *N. coryli*) showed that sterile, freely punctured bolls exposed to 2nd and 3rd instar nymphs of *Dysdercus nigrofasciatus* developed no disease, though others exposed to 4th and 5th instar nymphs became heavily infected. The percentage

amount of staining by each fungus found at maturity was high in bolls artificially inoculated when one to three weeks old, but rapidly declined as the age of the boll at the time of inoculation increased up to seven weeks, after which period it remained low. The loss in weight of lint due to disease declined similarly with the age of the boll at inoculation. Bolls inoculated before three or four weeks old represented a total loss. In Southern Rhodesia (Gatooma) as the season advanced puncturing and staining increased with increase in the stainer population (*D. superstitiosus*, *D. fasciatus*, and *D. intermedius*). The increased damage in the later part of the mature crop demonstrated the importance of early cropping. In Northern Rhodesia, when cotton plots were planted at various distances from areas where stainer host plants other than cotton occurred, one plot in close proximity to such areas became heavily stained, a second, about four miles distant from other hosts, was slightly stained, a third, three miles distant, showed no staining, although stainers were present, the insects probably having arrived too late to cause any damage, while in the fourth, four miles from any known host and entirely surrounded by *Isoberlinia* bush, no stainers were noted and the crop was clean.

Further attempts in the Gezira area, Sudan, to discover an Egyptian-type plant immune from blackarm (*Bacterium malvacearum*) were unsuccessful. A selection (N.T. 3/33) from Sakel resistant to leaf curl showed great purity for a characteristic vegetative habit and high yield. Two plots of a blackarm-resistant American-type cotton obtained from Uganda remained practically immune when sprayed with a suspension of *Bact. malvacearum*, this characteristic being retained in the following season. The propagation of the leaf curl resistant X 1530 [ibid., xiii, p. 369] was continued, some 770 acres being grown in the northern, central, and southern Gezira; though the seed was treated with abavit B serious blackarm developed during the early stages of growth. In a preliminary varietal test of yield, X 1530 and X 1730 appeared to be the types least affected by the Gezira form of 'wilt', which was severe locally.

In breeding tests in Bukalasa, Uganda, re-selections from the B. 31 group of strains continued to show very high resistance to angular leaf spot [*Bact. malvacearum*] and early blackarm, but appeared to be very susceptible to the *Fusarium* wilt [ibid., xiv, p. 82], which developed to a really serious extent. The yield of B. 31 was very disappointing. The most promising group for this area consisted of new selections from B. 37 families, which, though not very resistant to blackarm, appeared to tolerate it, and yielded well. A variety trial at Serere provided striking evidence that the U4/4/2 derivatives possess a resistance to blackarm which places them in an entirely different class from the Local cotton.

KULKARNI (G. S.). **Studies in the wilt disease of Cotton in the Bombay Presidency.**—*Indian J. agric. Sci.*, iv, 6, pp. 976–1048, 9 pl., 4 graphs, 1934.

This is a full tabulated account of the results of laboratory, greenhouse, and field studies carried out from 1923 to 1933 at the Cotton Research Station, Dharwar [*R.A.M.*, xii, p. 566], in the investigation of cotton wilt (*Fusarium vasinfectum*) in the Bombay-Karnatak region,

with particular reference to the biology of the fungus. Nutrition studies in pure culture indicated the improbability that any marked decrease in the field incidence of the disease could result from soil treatment with the various chemical fertilizers that were tested. There also was good evidence that variations in the kind, moisture, and reaction of the soil are of small value from the standpoint of control, but heavy applications (40 tons per acre) of farmyard manure appeared to have a controlling effect in the later developmental stages of the crop. Temperature studies showed that *F. vasinfectum* can tolerate a wide range from 20° to 40° C. with an optimum at about 28° and a thermal death point beyond 50°, but controlled experiments indicated that the disease is severe at soil temperatures between 20° and 27°, decreases at 28° to 31°, and is completely inhibited at 32° and above. As the fungus occurs fairly deeply (up to 20 inches) in the soil, and the soil temperature below six inches does not rise locally above an average of 32°, it follows that once introduced it can remain viable in the soil for a number of years; in some cases it was found to survive for seven years in soil kept free from susceptible varieties of cotton.

While further experiments based on the results of the investigation, including cultivation during the hot season, sowing on ridges instead of on flat land as usually practised, and earlier sowing did not give satisfactory results, the correlation between soil temperature and development of the disease is considered to be an important step in the solution of the preliminary questions concerning the influence of the environment on the occurrence of wilt. It has also been utilized in evolving a special technique for the breeding of wilt-resistant cottons which affords considerable economy in time and expense; this consists in growing plants in pot culture under optimum conditions for disease development for two months, and transferring the survivors to the field for propagation.

The paper terminates with a few recommendations for further investigations, such as the study of the physiologic specialization of the cotton wilt *Fusarium* and of the inheritance of disease resistance in the host. Preliminary experiments at Dharwar suggest that all the Indian cottons may be classed in the two groups, susceptible and resistant, for though certain intermediates exhibiting various degrees of resistance occur, it was shown that the partial resistance of these intermediates in the field is due to environment and not to heredity.

Likhite (V. N.) & Kulkarni (V. G.). **Relative parasitism of the Cotton root-rot organisms from Gujrat soils.**—*Curr. Sci.*, iii, 6, pp. 252–254, 1 fig., 1 graph, 1934.

Of the three organisms which were found to stand in causal relationship to cotton root rot in Baroda [*R.A.M.*, xiii, p. 697], the form of *Fusarium vasinfectum* isolated from 'gorat' soils is stated to have been shown to be non-pathogenic to cotton, presumably owing to its having been exposed to the action of such soils for two consecutive generations, since a fresh strain of the fungus obtained from a locality where cotton wilt exists gave a high percentage of infection. There was also evidence that the presence of the Baroda form of *F. vasinfectum* in affected

cotton plants was due to its general symbiotic association with nematodes.

Observations (later confirmed by controlled experiments) in 1931–2 showed that in cotton sown in May and irrigated seven times with well water (with a P_H value of 8) the percentage incidence of root rot associated with *Macrophomina* [*phaseoli*] and nematodes was 92, as compared with 28 to 58 per cent. in cotton sown during the monsoon season after the first showers; a study of the meteorological data for the period involved indicated that a soil moisture of 30 per cent. and a temperature of 40° C. favoured parasitism in *M. phaseoli* and nematodes jointly, but that as soon as these conditions disappear both organisms tend towards saprophytism in the soil.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **The quality of lint and seed from Cotton plants with Phymatotrichum root rot.**—*Phytopathology*, xxv, 1, pp. 104–113, 1935.

Data are presented in tabular form and discussed indicating that root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xiv, p. 304] appreciably affects the quality of lint and seed from Startex cotton plants in Texas, the damage being directly proportional to the earliness of the attack.

STROMAN (G. N.), TAUBENHAUS (J. J.), & EZEKIEL (W. N.). **Some effects of Phymatotrichum root rot on the microscopic characters of Cotton fibers.**—*Phytopathology*, xxv, 1, pp. 126–130, 1935.

The results [which are tabulated and discussed] of a microscopical examination of the fibres from Startex cotton plants killed by root rot (*Phymatotrichum omnivorum*) in Texas in 1931 [see preceding abstract] showed that those from individuals destroyed early in the season were abnormally wide and thick, with fewer convolutions per unit length than healthy material. The fibres from plants killed at a later stage of development did not differ appreciably from those of normal plants. The coarser, less twisted fibres from the plants killed in the early summer constituted less than 10 per cent. of the cotton harvested from plants grown under irrigation in the trials described, and would probably average not more than 20 per cent. of the crop from plants succumbing to root rot under dry-farming conditions.

DRECHSLER (C.). **Some conidial Phycomycetes destructive to terricolous Amoebae.**—*Mycologia*, xxvii, 1, pp. 6–40, 7 pl., 1935.

Three new genera of Phycomycetes capturing and destroying *Amoeba terricola* Greeff [*R.A.M.*, xii, p. 761] are fully described with Latin diagnoses, viz., *Endocochlus* (represented by *E. asteroides* n.sp.), *Bdellospora* (*B. helicoides* n.sp.), and *Zoopage* (*Z. phanera* n.sp.). A fourth genus, *Cochlonema* (*C. verrucosum* and *C. dolichosporum* n.spp.), similarly attacks *A. sphaeronucleolus* and another unidentified species of *Amoeba*. The organisms appear to form an allied group, the position of which between Mucorales and Entomophthorales is suggested. Their sexual reproduction is by zygosporangia formed from the conjugation of two similar hyphae.

MASERA (E.). **Fenomeni di antagonismo e antibiosi fra 'Bacillus prodigiosus Flügge' e 'Beauveria bassiana Vuill.'** [The phenomena of antagonism and antibiosis between *Bacillus prodigiosus* Flügge and *Beauveria bassiana* Vuill.]—*Ann. Sper. agr.*, xv, pp. 117–150, 1 fig., 1 graph, 1934.

The author gives a detailed account of investigations into the association between *Beauveria bassiana* [*R.A.M.*, xiii, p. 575] and *Bacillus prodigiosus* (both of which are pathogenic to silkworms) on the larvae of the flour beetle (*Tenebrio molitor* L.). When the larvae were fed on material containing both organisms together and separately the bacillus proved to be non-pathogenic, but *B. bassiana* killed many of the insects, irrespective of their age. The mortality due to the fungus alone and to the fungus and the bacillus together was, respectively, 57·8 and 39·1 per cent. In the 1,200 individuals exposed to the action of *B. bassiana* alone or with the bacillus mortality set in between the 9th and 10th days, gradually increased to a maximum between the 30th and 50th days, and then declined to the 93rd day, when the experiment terminated.

Tests *in vitro* afforded clear evidence of the inhibitory action of the bacillus on the fungus [cf. ibid., viii, p. 758] brought about on solid media by the fact that the former grew more rapidly than the latter and in liquid media by the liberation of toxins, probably owing to the bacterial lysis, which proved toxic to the mycelium. In liquid (broth) cultures in which the fungal growth was well established before the bacillus was added, the development of the latter was inhibited, probably because the extensive mycelial development on the surface of the liquid interfered with the respiratory activity of the bacillus.

A bibliography of 116 titles is appended.

CIFERRI (R.) & REDAELLI (P.). **Studii sul Coccidioides immitis Stiles. I. Fenomeni di endosporulazione e di coniugazione in vitro.** [Studies on *Coccidioides immitis* Stiles. I. Phenomena of endosporulation and of conjugation *in vitro*.]—*Boll. Soc. ital. Biol. sper.*, ix, 7, pp. 602–604, 1934.

The phenomenon of endosporulation in the chlamydospores of *Coccidioides immitis* [*R.A.M.*, xiv, p. 234] was observed in cultures from the pus of experimental lesions in guinea-pigs, sown on rabbit's blood- or ascites-serum at 37° to 38° C. under anaerobic conditions. The sporangia were perfectly characteristic, with densely spinescent capsules, but measuring only about half the size of those formed in the host tissues and containing proportionately fewer aplanetic zoospores, the latter being similar to those produced in living animal tissues by relatively avirulent strains of the fungus.

Fusion between two chlamydospores was also observed under the above-mentioned conditions for the first time, the process being analogous to that occurring in certain Olpidiaceae, e.g., *O. viciae* Kusano [ibid., xi, p. 720] and *O. brassicae* [ibid., v, pp. 175, 715; vi, p. 69; vii, p. 202; viii, p. 283] and in *Synchytrium*. A further point of resemblance between the lower Chytridiales and *C. immitis* lies in the presence of a 'companion cell', i.e., a gamete emptied of its plasmatic content and adhering to the zygote. The obscure phenomenon of tricellular fusion was also noticed.

Ciferri (R.). & Redaelli (P.). **Studii sul Coccidioides immitis Stiles. III. La vita saprositica del fungo e il suo potere ammonizzante.** [Studies on *Coccidioides immitis* Stiles. III. The saprophytic life of the fungus and its ammonifying capacity.]—*Boll. Soc. ital. Biol. sper.*, ix, 7, pp. 746–748, 1934.

Various natural substrata of animal or vegetable origin, such as rich garden soil, stable manure, wheat grains, poultry feathers, horsehair and hoofs, human hair, and the like, were found to constitute suitable media for the growth of *Coccidioides immitis* [see preceding abstract]. Development is relatively slow, requiring from 45 days to two months to show up, and is more profuse at 23° to 25° than at 35° to 37° C. Under such conditions the fungus forms a more or less dense, whitish mat on which are produced hyphae and a few chlamydospores.

Ammonia was produced by the fungus in peptone solutions, with or without glucose, and in sterile soil to which peptone was added, the amount being in general proportionate to the initial acidity of the medium.

Trabucchi (E.). **Ricerche sui principii attivi della Segale cornuta. I. Dosaggio chimico e biologico degli alcaloidi specifici. II. Il contenuto in istamina degli estratti fluidi.** [Studies on the active principles of ergot of Rye. I. Chemical and biological dosage of the specific alkaloids. II. The histamin content of the fluid extracts.]—*Boll. Soc. ital. Biol. sper.*, ix, 7, pp. 501–507, 1934.

Analyses of the alkaloid and histamin contents of extracts of various samples of ergot of rye [*Claviceps purpurea*: *R.A.M.*, xiv, p. 93] prepared by the standard methods laid down in Italian and foreign pharmacopoeias having shown a marked deficiency of both these principles, it is assumed that the well-known therapeutic value of the preparations in question resides in other substances of which the nature is obscure.

Boyle (L. W.). **Histological characters of Flax roots in relation to resistance to wilt and root rot.**—*Tech. Bull. U.S. Dep. Agric.* 458, 18 pp., 4 pl., 1934.

Five varieties of flax differing markedly in their reaction to the group of root-parasitic fungi, including *Fusarium lini* [*R.A.M.*, xiv, p. 310], *Asterocystis radicis* [ibid., xiv, p. 12], *Thielavia basicola* [ibid., x, p. 731], *Pythium megalacanthum* [ibid., xiv., p. 77], and *Rhizoctonia* [ibid., iii, p. 265], infesting North Dakota soils that have been continuously under this crop, were studied to determine the histological characters governing relative resistance. The varieties fell into three groups: (1) resistant, represented by Bison, Morye, and Pehanjo; (2) semi-resistant (Ottawa White Flower); and (3) susceptible (Common). No correlation was found between resistance to disease and the deposition of suberin- and lignin-like substances on or in the cortical cell walls of the roots, in the development of the endodermis, or in the constitution of the middle lamellae. The reaction to infection by cell content or cell wall alteration was also similar in susceptible and resistant types. Differences were observed, especially in 20-day-old field-grown plants, between resistant and semi-resistant or susceptible strains of flax in the stability of the cortical cell

walls of the roots as measured by their resistance to hydrolysis by sulphuric acid and the amounts of non-hydrolysable materials that they contained.

Flax growing in soils successively producing this crop over a lengthy period is liable to two types of disease, namely, wilt (*F. lini* and, according to an unpublished thesis by R. B. Streets, University of Wisconsin, 1924, *F. martii* var. *viride* and *F. zonatum* [*F. vasinfectum* var. *zonatum*: ibid., xii, p. 317]) and root rot, in which, besides the fungi listed in the opening paragraph, other species of *Fusarium* may also be implicated. Resistance to each of these two types of disease appears to be correlated with distinct characters in the plants. Reynolds has attributed resistance to *F. lini* to the presence in flax extracts of toxic substances inhibiting the growth of the fungus, while as regards capacity to withstand root rot the outcome of field and histological studies indicates that a part is played by the more rapid and extensive development of stability in the cortical cell walls of the roots.

Brierley (P.). **Symptoms of Rose mosaic.**—Abs. in *Phytopathology*, xxv, 1, p. 8, 1935.

Rose species and varieties exhibit a wide range of chlorotic leaf symptoms suggesting virus infection. Few of these chlorotic types produce mosaic symptoms on budding to Madame Butterfly or other hybrid teas susceptible to White's mosaic [*R.A.M.*, xiv, p. 171]. Among the virus-like types not transmissible by this method is the conspicuous and prevalent crinkle of Manetti. A yellow variety of White's mosaic has been found in Canada and parts of the United States on the Hybrid Tea, Perpetual, and Rugosa types, and like the original form appears to be transmissible only by tissue union.

Brierley (P.). **Streak, a virus disease of Roses.**—Abs. in *Phytopathology*, xxv, 1, pp. 7–8, 1935.

Roses at the Arlington Experiment Farm, Virginia, and elsewhere are stated to be commonly affected by a virus disease producing brownish or reddish circular or veinbanding patterns on the leaves or ring patterns on the shoots. On inoculation by budding, certain hybrid teas, such as Madame Butterfly, develop necrotic areas round the inserted bud. Girdling of the stem usually takes place at the site of the bud, the distal parts die, while the foliage withers but persists. The young lateral branches below the inserted bud frequently show nearly black, sharply defined secondary lesions. Transmission of the virus has been effected only by tissue union. Streak is clearly distinct from mosaic [see preceding abstract] and apparently also from the wilt and die-back described by Grieve from Australia [ibid., x, p. 733].

Deacon (G. E.). **Some effects of Botrytis cinerea on Roses.**—*Rose Annu. 1934*, pp. 62–66, 4 figs., 1934.

Severe die-back is stated to have been produced in actively growing roses of different varieties, including Mrs. A. R. Barraclough, by inoculation experiments with pure cultures of *Botrytis cinerea* isolated from plants showing spontaneous symptoms of the disease in the Norwich district. Control measures are briefly indicated.

Pape (H.). **Löwenmaulrost (Puccinia antirrhini Diet. et Holw.), eine für Deutschland neue Krankheit an Gartenlöwenmaul (Antirrhinum majus L.).** [Snapdragon rust (*Puccinia antirrhini* Diet. et Holw.), a disease of cultivated Snapdragon (*Antirrhinum majus* L.) new to Germany.]—*NachrBl. dtsch. PflSchDienst*, xiv, 12, pp. 113–115, 3 figs., 1934.

Snapdragon rust (*Puccinia antirrhini*) was reported in Germany in July, 1934 [*R.A.M.*, xiv, p. 239 and next abstract] and near Berlin a month later. In an account of the cause and symptoms of the disease it is stated that in one nursery the Primadonna variety remained uninfected when Karminkönigin was heavily attacked. According to Dr. Poeverlein, W. Freiberg of Treves is reported to have found the rust in the fruit capsules, destroying the ovaries and seed, and Poeverlein also states that it was detected by Viennot-Bourgin near Grignon, France, on the wild snapdragon (*Antirrhinum orontium*), which has not hitherto shown any symptoms of the disease in Germany.

Andres (H.). **Der Löwenmaulrost (Puccinia antirrhini Dietel et Holway) in Westdeutschland. (Vorläufige Mitteilung).** [Snapdragon rust (*Puccinia antirrhini* Dietel et Holway) in western Germany. (Preliminary note).]—*Ber. dtsch bot. Ges.*, lii, *1934*, 10, pp. 614–616, 1935.

It is stated in this account of the occurrence of *Puccinia antirrhini* near Bonn in 1934 [see preceding abstract] that Dietel has found that teleutospores formed on the stems may reach a length of 75 μ and have a conical apex and a stalk up to 130 μ, as against 30 to 55 μ with rounded apex and stalk equal to the spore length in the diagnosis of the species and in the sori formed on the leaves. Similar differences between leaf and stem material have been detected by Prof. Dietel only in the case of *P. magnusiana* teleutospores on *Phragmites*. A list is given of the German localities so far known to harbour the snapdragon rust, including besides Bonn and Cologne, other parts of Rhenish Prussia, Westphalia, Baden, Bavaria, Pomerania, and the towns of Berlin and Weimar.

Guterman (C. E. F.). **Control of Aster leaf rust.**—Abs. in *Phytopathology*, xxv, 1, pp. 17–18, 1935.

Commercial China aster [*Callistephus chinensis*] plantings in New York State have been found very liable to leaf rust (*Coleosporium solidaginis* [*R.A.M.*, x, pp. 497, 534], good control of which was obtained in 1934 by eight applications of sulfodust [ibid., x, p. 370], green kolodust [ibid., xiii, pp. 407, 619], flotation sulphur spray, or 3–1½–50 Bordeaux mixture, in descending order of efficacy. Sulfodust reduced the number of lesions per leaf from 18·9 in the check plots to 0·2. In susceptibility tests with 60 commercial varieties virtual immunity from the rust was manifested by California Giant, Giant Branching Comet, Salmon Queen, Imbricated Pompon, and Lilliput flowered (rose, dark blue, and white).

Burkholder (W. H.) & Guterman (C. E. F.). **Bacterial leaf spot of Carnations.**—*Phytopathology*, xxv, 1, pp. 114–120, 1 fig., 1 graph, 1935.

Heavy losses are stated to be caused in the east-central United States and on Long Island by the bacterial leaf spot of carnations due to *Phytomonas woodsii* [*R.A.M.*, x, p. 84], to which the Sophelia variety has shown great susceptibility during the last three years, while Spectrum Supreme, Salmon Spectrum, Potentate, and Patrician have suffered to a lesser extent. Other workers have reported Red and White Matchless, Betty Lou, Eldora, Rosalind, and Sceptre as susceptible. The necrotic spots are sunken, oval, and concentrically zonate with alternating pale brown and purplish rings in the centre and a water-soaked, yellow border. They average 8 to 12 mm. in length and may extend right across the leaf, which ultimately turns straw-coloured, shrivels, and dies. Infection proceeds from the base upwards and may occasionally involve the stems and flower buds. Positive results were given in all cases of inoculation with *P. woodsii* on wounded carnation leaves but not on uninjured tissues. The organism usually occurs singly, is motile by one or more polar flagella, Gram-negative, and measures 1·05 to 2·10 by 0·47 to 1·05 μ (average 1·56 by 0·67 μ). It ferments a number of carbohydrates, produces ammonia in beef-extract bouillon, and grows best at 75° F.

Tilford (P. K.). **Fasciation of Sweet Peas: a bacterial disease.**—Abs. in *Phytopathology*, xxv, 1, p. 36, 1935.

A seed-borne bacterium distinct from *Bacterium tumefaciens* has been isolated from numerous greenhouse sweet peas suffering from a disease the symptoms of which resemble fasciation [*R.A.M.*, ix, p. 527]. Inoculation experiments with the organism gave positive results on sweet and garden peas. Affected plants develop many short, fleshy, thick, aborted stems with misshapen leaves arising from the somewhat dwarfed but otherwise normal main stem at or below soil level, or from the hypocotyl region.

Weiss (F.). **A fungus spot of Azalea flowers.**—Abs. in *Phytopathology*, xxv, 1, p. 38, 1935.

Cultivated azaleas (*Azalea indica*) [*Rhododendron indicum*] in South Carolina were decimated in 1931 by a hitherto unknown disease which caused spotting followed by collapse of the flowers at the period of maximum bloom between late February and mid-April. In addition to various innocuous organisms, a fungus of exceptional morphology was isolated from the diseased flowers and proved by inoculation tests to be solely responsible for the typical symptoms. Within the flower tissues a coarse, septate mycelium is produced and thoroughly disorganizes the cells. The first fructifications are conidia suggestive of *Ovularia*, succeeded by microconidia resembling those of *Sclerotinia*; ultimately cupulate, smooth, black sclerotia are produced. Microconidia and sclerotia, but not conidia, develop readily on artificial media. Indications of heterothallism and of immature Discomycetous fruit bodies have been observed in culture. The agency of bees in the introduction of the fungus into the flowers has been demonstrated.

Pohlmann (J.). **Botrytis-Krankheit bei Solanum.** [*Botrytis* disease in *Solanum.*]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 2, p. 19, 1 fig., 1935.

The attractive, recently developed *Solanum* [*capsicastrum*] variety known as New Paterson is stated to suffer severe damage in Germany from the attacks of grey mould (*Botrytis*), which was not observed on the old Henderson type. Diseased plants may be recognized by their limp, yellow leaves and greyish-yellow, shrivelled berries, and on closer examination by a fine, grey, pulverulent coating over the twigs. Infection is promoted chiefly by closeness and humidity of the atmosphere and may be prevented by giving the plants plenty of light and air and keeping them moderately dry.

Beaumont (A.). **Diseases of Narcissi and Tulips.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iii, pp. 184–191, 1935.

In this paper the author gives an extensive list of narcissus and tulip diseases with brief notes on their symptoms and control. The diseases of the former host occurring in England include grey mould or smoulder (*Botrytis narcissicola*) [*R.A.M.*, xi, p. 786], leaf scorch (*Stagonospora curtisii*) [ibid., xiii, p. 447], white mould (*Ramularia vallisumbrosae*) [ibid., xii, p. 551], fire (*B. polyblastis*) [ibid., ix, p. 624], the rusts due to *Coleosporium narcissi* and *Puccinia schroeteri*, chlorosis, physiological purple spot, grey disease or stripe, yellow stripe, rootplate rot and root rot associated with *Cylindrocarpon radicicola* [ibid., xii, p. 224], bulb rot associated with *Fusarium bulbigenum* [loc. cit.], *Penicillium* storage rot, black bulb rot (*Rosellinia necatrix*) [ibid., ix, p. 624] and the similar condition due to *Armillaria mellea* [ibid., xi, pp. 376, 786], secondary bulb decay (associated with *Trichoderma viride*, bacteria, *Penicillium* spp., and *Rhizopus nigricans*), and scale speck, due to an organism not yet definitely identified. Grey disease is characterized by longitudinal striping or mottling, generally over the whole leaf surface and frequently extending to the flower. The size of the bulbs and the rate of increase are usually reduced. As the symptoms vary on different varieties and in different seasons, a number of diseases may be concerned. No evidence has been obtained that the disease, as found in England, is due to a virus [cf. ibid., xi, pp. 578, 785]. Yellow stripe, first observed by the author in 1929, was very serious on King Alfred and related Trumpet varieties in 1932; it differs from grey disease (of which it may possibly be a varietal form) in that under good cultural conditions there is a large percentage of recovery in subsequent seasons. It may be a foliage symptom associated with a bulb disease.

The tulip diseases dealt with include fire (*B. tulipae*) [ibid., xiii, p. 10], shanking and blossom blight (*Phytophthora* spp.), greenhouse spot (*F. tubercularioides*) [ibid., xiii, p. 681], breaking [ibid., xiii, p. 446], and *Penicillium* storage rot. The paper concludes with general notes on control.

Ainsworth (G. C.). **Spotted wilt of Richardias (Arums).**—*Gdnr's Chron.*, xcvii, 2507, p. 31, 1 fig., 1935.

Attention is drawn to the occurrence in England of tomato spotted wilt [*R.A.M.*, xiv, pp. 129, 262] on the arum lily (*Richardia africana*)

[*Zantedeschia aethiopica*], stated to have been first reported early in 1934 by L. Ogilvie and K. M. Smith. The disease is marked by the development of yellow spots, blotches, or streaks on the leaves, white streaks on the foliage and petioles, and pale, blotchy lesions on the green flower buds. The leaves are variously crinkled and twisted, and the flowers deformed. This is stated to be the first recorded monocotyledonous host of spotted wilt. Eradication of infected plants and measures to control the insect vector, *Thrips tabaci*, are recommended.

WOLF (F. A.). **Morphology of Polythrincium, causing sooty blotch of Clover.**—*Mycologia*, xxvii, 1, pp. 58–73, 5 figs., 1935.

This is a morphological study of the fungus responsible for the sooty blotch of clover, the life-cycle of which comprises a conidial, a spermogonial, and a perithecial stage. The undulate character of the conidiophores is the consequence of sympodial branching. Each conidiophore produces a series of conidia, the delimitation of each of which is followed by elongation of the conidiophore. The spermogonia and perithecial fundaments are both formed during the autumn within the same or in separate stromata; each is locular. The spermogonia produce spermatia which are apparently essential to the development, in the following spring, of the perithecia.

The fungus has received several names, including *Sphaeria trifolii*, *Placosphaeria trifolii*, *Polythrincium trifolii*, *Phyllachora trifolii*, *Plowrightia trifolii*, and *Dothidella trifolii* [*R.A.M.*, iv, pp. 96, 396, 446; viii, p. 176], none of which, in the writer's opinion, correctly interprets its taxonomic characters in the family Dothidiaceae. The new generic name of *Cymadothea* is proposed for it, on the ground that its conidial mechanism is distinctive. Latin diagnoses are given of the new genus and its type species, *C. trifolii* (Pers.) comb. nov.

WORMALD (H.). **The brown rot diseases of fruit trees.**—*Bull. Minist. Agric., Lond.*, 88, 50 pp., 40 figs., 1935.

In this bulletin, written both for mycologists and practical growers, an authoritative and up-to-date account is given of the available information on the brown rots of fruits caused by *Sclerotinia fructigena*, *S. laxa*, and *S. fructicola* [*R.A.M.*, xiii, pp. 33, 110]. Short sections are devoted to the history of early English and foreign investigations into the condition, the nomenclature, geographical distribution, morphology and cultural characters of the causal organisms, and the pathology of, and losses caused by the diseases. Notes are given on the brown rots and their control as affecting the different hosts, apple, pear, plum, cherry, peach, apricot, and quince. Bibliographies of works by British and other writers are appended, and there are forty plates and drawings, all except four by the author.

ATANASOFF (D.). **Mosaic disease of drupaceous fruit trees.**—*Annu. Univ. Sofia*, xiii, pp. 9–42, 26 figs., 1934.

In this paper a general account is given of the author's observations up to date on plum pox [*R.A.M.*, xii, p. 229], for which he now prefers the name mosaic, as certain hosts show no surface depressions on the fruit, while all show pronounced leaf mottling. The disease has been

observed in Bulgaria, Czecho-Slovakia, Holland, England, and the United States on almond, apricot, cherry, peach, and plum. It is intertransmissible, and can easily be communicated from diseased to healthy trees by budding; under natural conditions it is spread from plum to plum (and probably to other hosts) by the aphid *Anuraphis padi*. Successful transmissions by budding were made from apricot, cherry, and plum to plum; from cherry, plum, and peach to peach; and from plum to cherry.

MacLachlan (J. D.). **The hosts of Gymnosporangium globosum Farl. and their relative susceptibility.**—*J. Arnold Arbor.*, xvi, 1, pp. 98–142, 4 pl., 3 graphs, 1 map, 1935.

A full account is given of the author's studies from 1932 to 1934, in the Arnold Arboretum, of the relative susceptibility to *Gymnosporangium globosum* [*R.A.M.*, xiii, p. 311] of the aecidial hosts of the rust included in ten genera of the Pomoideae. Taken in conjunction with those of previous workers his results indicated that species of *Crataegus* differ widely in their susceptibility, this depending primarily on the thickness and rapidity of formation of the leaf cuticle; none of the groups examined (including altogether nearly 550 species) proved to be wholly immune. Of the 17 species of *Pyrus* tested, 1 was found to be very susceptible, 2 moderately susceptible, 10 (including *P. communis*) resistant, and 3 immune. Two of the 7 American species of *Malus* which were inoculated proved to be mildly and one moderately susceptible, while of the 27 Eurasian types tested infection was obtained on only 1 species and 3 hybrids, as well as on 2 hybrids between American and Eurasian species. Certain of the commercial varieties of apples, however, appear from previous reports to be more susceptible than the species tested. All the American species and varieties of *Sorbus* inoculated were susceptible, while of the 31 species and varieties of Eurasian origin 27 proved to be immune and 4 resistant. Inoculations on 17 species and varieties of *Amelanchier* gave negative results, and no reports could be found indicating high susceptibility of representatives of this genus to the rust, although it has been recorded on *A. canadensis* and *A. alnifolia*. *Cydonia oblonga* was shown to be moderately susceptible, and the rust has been reported as occurring commonly on quince in New Jersey. Species of *Crataegomespilus*, *Mespilus*, *Sorbaronia*, and *Sorbopyrus* were more or less susceptible, while the genera *Comptonia*, *Myrica*, and *Photinia* were shown by inoculations to be immune.

While according to previous reports the host list of the teleutospore stage of *G. globosum* includes at least six species of *Juniperus*, there is no information to date to indicate that any species other than *J. virginiana* and *J. scopulorum* and their varieties suffer to any extent from infection with the rust.

The paper includes a complete list of all the known hosts of *G. globosum*.

Nusbaum (C. J.). **A cytological study of the resistance of Apple varieties to Gymnosporangium juniperi virginianae.**—Abs. in *Phytopathology*, xxv, 1, p. 30, 1935.

The sporidial germ-tubes penetrated equally well into leaves of four

apple varieties differing in their reaction to rust (*Gymnosporangium juniperi-virginianae*) [*R.A.M.*, xiv, p. 150]. A conspicuous primary hypha was formed in an epidermal cell, but further mycelial development was regularly intercellular, with characteristic haustorial production. In Wealthy leaves at a susceptible stage, the pathogen made vigorous growth. The other varieties tested showed resistance, due evidently to a definite antagonism of the host cells to the invading parasite. This reaction was mild in Yellow Transparent, noticeable in Fameuse, and very pronounced in Baldwin. With advancing maturity Wealthy leaves gradually acquired resistance, the rust failing to develop pycnidia in those that had just reached full size and being unable to effect epidermal cell penetration a few weeks later.

Turnbull (J.). **Fruit tree spraying equipment.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iii, pp. 24–32, 1935.

Helpful practical notes (designed to assist growers in the selection of the most efficient spraying materials and methods) are given on spraying outfits (with particular reference to the correct estimate of the pump capacity required and the maintenance of efficient pressure), spraying systems (mechanical, mobile, headland, and central), and spray nozzles, lances, and guns. The paper is followed by a discussion.

Carter (Miss F. M.). **A brief account of fungi present in the air over orchards, with especial reference to Pleospora and Polyopeus.**—*Trans. Brit. mycol. Soc.*, xix, 2, pp. 145–153, 1 fig., 1935.

The author gives a list of the fungi, belonging to 34 genera (with the specific name where determined), which were obtained from the air in apple orchards at East Malling Research Station, at the Horticultural College, Swanley, and in the vicinity of Belfast [cf. *R.A.M.*, xi, p. 51]. Cultural details are also given of 16 strains of *Pleospora herbarum* and 8 apparently hitherto undescribed forms of *Polyopeus*, both of which were very frequently found in the exposed plates and are definitely known to cause apple fruit rots [ibid., xiii, p. 583]. The investigation suggests that storage diseases of apples are chiefly due to fungal infection from the atmosphere before harvest.

Annotated bibliography on bitter-pit.—*Occ. Pap. Bur. Fruit Prod. E. Malling*, no. 3, 28 pp., 1934.

This useful bibliography, preceded by a short introduction by J. Barker on the prevention of the disease, includes very brief summaries of the chief papers published since 1869 on bitter pit of apples [*R.A.M.*, xiii, p. 707].

Riker (A. J.), Palmiter (D. H.), & Hildebrand (E. M.). **Some environmental factors influencing the development of Apple hairy-root and of Phytomonas rhizogenes.**—Abs. in *Phytopathology*, xxv, 1, p. 32, 1935.

In soil at 75 per cent. of its moisture-holding capacity the highest incidence of infection in inoculations with the hairy root organism *Phytomonas* [*Bacterium*] *rhizogenes* [*R.A.M.*, xiv, p. 289] occurred at a soil temperature of 28° C., and the largest hairy root growth at 24°.

Hairy root formation was slightly greater at 90 per cent. moisture than at 75, but infection rather less. The organism grew best on yeast infusion-mannitol and carrot extract agars at 28°, and produced the most acid and densest turbidity in a yeast infusion-mannitol liquid medium at the same temperature.

HILDEBRAND (E. M.) & MACDANIELS (L. H.). **Modes of entry of Erwinia amylovora into the flowers of the principal pome fruits.**—Abs. in *Phytopathology*, xxv, 1, p. 20, 1935.

The causal organism of fireblight (*Erwinia amylovora*) [*Bacillus amylovorus*: *R.A.M.*, xiv, p. 318 and next abstracts] appears to enter pear, apple, and quince flowers through the following natural openings: (1) non-cutinized tissue (stigmatic surface, anther); (2) hydathodes (sepals); (3) stomata (style, fruit exterior, sepals); and (4) specialized nectar-secreting stomata (receptacle cup).

ROSEN (H. R.). **The mode of penetration of Pear and Apple blossoms by the fire-blight pathogen.**—*Science*, N.S., lxxxi, 2088, p. 26, 1935.

The fireblight pathogen (*Erwinia amylovora*) [*Bacillus amylovorus*] has been observed in Arkansas to penetrate the nectarial region of apples and pears [see preceding and next abstracts] by way of the stoma-like channels through which the nectar is exuded, here termed 'nectarthodes'. This mode of ingress appears to be much more common in pears, with their broad, open, shallow calyx cups, than in apples, the calyx cups of which are narrow, elongated, and tightly covered. The organism is further capable of penetrating the stigmatic surfaces of both pear and apple gynoecia and the anther locules, possibly with an extension into the filaments. These points of entry are additional to those already known in the calyx and corolla.

LINK (G. K. K.). **Relation of carbohydrate-nitrogen nutrition to disposition of Apple to infection by Erwinia amylovora.**—Abs. in *Phytopathology*, xxv, 1, p. 26, 1935.

Stayman apple trees were grown in sand culture in Chicago tanks, one lot receiving, once only, a complete or plus-nitrate (2·08 gm. per plant) solution, and the other a solution without nitrate. Both lots were inoculated simultaneously with *Bacillus amylovorus* [see preceding abstracts], to which the succulent, large-leaved shoots of the plus-nitrate (low carbohydrate-nitrogen ratio) plants proved susceptible, while the short, thin, woody, small-leaved shoots of the series without nitrate were resistant. The former maintained their susceptibility throughout the season in new shoots developed below the lesions. These results are considered to illustrate the role of past experience in etiological complexes of health and disease in plants [cf. *R.A.M.*, xiii, p. 253].

HILDEBRAND (E. M.). **Longevity of the fire-blight organism in the honey-bee environment.**—Abs. in *Phytopathology*, xxv, 1, p. 20, 1935.

The following facts, ascertained in the course of three years' studies in New York, are thought to denote the improbability of the overwintering of *Erwinia amylovora* [*Bacillus amylovorus*] in the beehive [*R.A.M.*, xiv, p. 318]: (1) the disappearance within three days of the

bacteria from honey elaborated from food containing the organism; (2) the inability to identify the organism with stages in the insect's life-cycle; (3) the relatively high temperatures (up to 35° C.) of the bodies of honey-bees and of hive interiors; (4) the short life of the bacteria in sugar solutions at different concentrations and constant temperatures; and (5) the relatively poor dissemination of the bacteria to flowers caged with honey-bees fed on heavily infected sugar solutions.

MARCHIONATTO (J. B.). **Argentine Republic: the overwintering stages of Pear and Apple scab.**—*Int. Bull. Pl. Prot.*, ix, 1, pp. 1–2, 1935.

Notes are given on the prevalence of apple and pear scab in the Argentine Republic, where the perithecial stage of the two causal organisms, *Venturia inaequalis* and *V. pirina*, was observed for the first time in 1934.

LOEWEL (E. L.). **Die Wirkung der Vorblütenspritzungen gegen Fusikladium.** [The effect of the pre-blossom sprays on *Fusicladium.*]—*Obst- u. Gemüseb.*, lxxxi, 1, pp. 8–9, 1935.

A tabulated account is given of the writer's experiments against *Fusicladium* [*Venturia inaequalis*] on Schur apples in the Lower Elbe valley, Schleswig-Holstein [*R.A.M.*, xiii, p. 449], from which it appears that the best of the pre-blossom treatments tested were the 'Baumspritzmittel' (a tar product of the same order as carbolineum) at the rate of 8 per cent. and 1 per cent. Bordeaux (Wacker). In the trials described the former preparation was applied on 4th to 5th April and the latter on 30th May, followed by the usual four post-blossom treatments.

FOSTER (H. H.). **Infection of Apple leaves by Physalospora cydoniae.**—Abs. in *Phytopathology*, xxv, 1, pp. 16–17, 1935.

Only 10 out of 30 strains of *Physalospora cydoniae* [? *P. obtusa*: *R.A.M.*, xiv, p. 316] consistently produced infection on inoculation by means of pycnospore suspensions on apple leaves. Eight of the 10 were derived from rotted apple and quince fruits in the eastern States [cf. ibid., xiii, p. 312], one from a Chinese quince [*Pyrus sinensis*] in France, and one from an apple leaf in South Carolina. The incubation period ranged from 24 to 72 hours. Penetration was found to take place through the stomata.

BAINES (R. C.). **Phytophthora trunk canker of Apple.**—Abs. in *Phytopathology*, xxv, 1, p. 5, 1935.

A destructive, irregular canker of Grimes apples in Indiana is caused by *Phytophthora cactorum* [cf. *R.A.M.*, ix, p. 392], which may partially or completely girdle the trunk and bases of the main branches. The first external symptom is a wet area on the bark, but the fungus penetrates into the sapwood. Successful inoculations were obtained on the trunks but not on the limbs. The scarification of the diseased areas gave promising results as a control measure.

BERG (A.). **Black pox and other Apple-bark diseases commonly known as measles.**—*Bull. W. Va agric. Exp. Sta.* 260, 24 pp., 7 pl., 3 figs., 1934. [Received April, 1935.]

After a brief review of the literature dealing with the papular or bark-blistering diseases of the apple, which have been apparently confused together under the name of measles, the author gives details of his studies [abstracts of some of which have already been noticed: *R.A.M.*, xi, p. 248; xii, p. 378, and above, p. 349] of the trouble in West Virginia. He found that there are at least three different diseases involved, one of which (termed black pox) is due to an apparently hitherto undescribed species of *Helminthosporium* (previously thought to be a *Clasterosporium*) [loc. cit.], for which the name *H. papulosum* n.sp. is suggested, a Latin diagnosis being appended. The conidiophores arise most abundantly from the central surface of the dead, scaly patches on the bark, either singly or united at the base in fascicles; they are dark brown, typically three- to many-septate, 64 to 110 by 4·2 to 5·9 μ in diameter. On the natural substratum the apically abstricted conidia are sub-hyaline to fuliginous, three- to many-septate, usually widest at the second segment from the base, with a blunt basal end bearing a pronounced dark scar, and measure 29 to 46 by 6·6 to 8·2 μ; under moist conditions they tend to produce narrow, thin-walled, apical elongations of three to more cells which are easily broken off. Germination is effected by two polar germ-tubes. In pure culture the fungus grows very slowly even at the optimum temperature (about 28° C.), and makes no growth below 15°. The conidia produced on artificial media are much more irregular in size and shape and show a tendency to degenerate; a rather unusual feature is the presence on such conidia of spherical vesicles of an exudate which is produced usually after the formation of the third or fourth segment, and which is retained on the mature conidium as an enveloping sheath. *H. papulosum* was also isolated from black fruit spots on Grimes Golden apples at Purdue, Indiana [ibid., xii, p. 378], but this phase of the disease does not appear to be important under West Virginian conditions. The disease occurs in New Jersey, Ohio, Indiana, and Mississippi, in the last-named State also on Bartlett pears. Experiments in 1933 indicated that it can be controlled to a considerable extent by thorough spraying with Bordeaux mixture or lime-sulphur.

The second disease, which is widespread and destructive on the Delicious variety of apples, was shown to bear no relationship to black pox. It often attacks young trees in a vigorous growing condition; when severely affected the trees may soon be killed, while in milder cases they may linger for several years in an unthrifty and stunted state; trees only slightly attacked usually recover. The cause of this disease has not yet been established. Owing to the frequent presence of groups of necrotic cells deep in the bark, it is provisionally termed internal bark necrosis pending the establishment of its relationship to the third type or true measles which has also been observed in West Virginia mostly on Jonathan and York apples, chiefly on older trees past their prime and weakened apparently by some other cause; this last disease has not been studied more closely because it does not appear to be very injurious.

Cooley (J. S.). **Relation of host vigor to Apple infection with Xylaria mali.**—Abs. in *Phytopathology*, xxv, 1, pp. 12–13, 1935.

Monthly inoculation experiments for two years with *Xylaria mali* [*R.A.M.*, xiii, p. 384] on three-year-old apple seedlings at Rosslyn, Virginia, indicated that the period of maximum susceptibility to the fungus is correlated with the minimum degree of root activity. Suppressed trees in the nursery row were much more liable to attack than those growing normally, while defoliation in August also enhanced susceptibility. Evidently a weakened host condition resulting from drought or other environmental factors predisposes the trees to severe root-rot infection.

Haussmann (G.). **Contributo alla conoscenza delle malattie crittogamiche delle frutta refrigerate.** [A contribution to the knowledge of fungal diseases of fruit in cold storage.]—*Ann. Sper. agr.*, xv, pp. 101–116, 5 pl. (2 col.), 1934.

When healthy apples of ten varieties grown in two localities in Piedmont were stored at 1° to 3° C., the varieties most resistant to fungal attack were Ranetta verde, Verdese (both grown at Cuneo), and Calvilla Lesson. After three months' storage the first-named showed a loss in weight from fungal decay of 5 per cent., while the other two even after six months showed only a trace of attack, infection in all three cases being due to *Penicillium* spp. Most of the decay found on the other varieties was of the green or black type due, respectively, to *P.* spp. (including *P. olivino-viride*, *P. italicum*, and *P. expansum*) and *Cladosporium nodulosum* Cda.

Pavarino (G. L.). **Contributo allo studio del disfacimento interno delle Pere.** [A contribution to the study of internal breakdown of Pears.] —*Ann. Sper. agr.*, xv, pp. 23–29, 5 col. pl., 1934.

In this account of a microscopical and microchemical study of internal breakdown in three varieties of pears in cold storage in Italy [*R.A.M.*, xii, p. 102], the author describes the histology of the affected tissues and the pathological changes undergone by the cells. In the mesocarp of the diseased pears a light, apparently normal, starchy zone surrounds the blackened endocarp, and outside this is a discoloured, rather narrow zone of spongy, brownish, necrosed tissue in which the cohesion of the cells is diminished. The vessels in the discoloured area are dark brown and this alteration appears to precede that of the surrounding tissues. In fruits with different anatomical characters the disease assumes a slightly different appearance macroscopically, but the structural alterations remain substantially the same. The most resistant varieties are those which have a granular flesh and only a small amount of spongy tissue.

Goidànich (G.). **Una nuova specie di 'Ceratostomella' ('Ceratostomella catoniana' G. Goid. n.sp.) vivente sul Pero.** [A new species of *Ceratostomella* (*C. catoniana* G. Goid n.sp.) living on the Pear.]—*R.C. Accad. Lincei*, xxi, 3, pp. 199–201, 1935.

A preliminary note is given on a new species of *Ceratostomella*, *C. catoniana*, isolated by the writer from two-year-old pear trees showing

a sectorial chestnut discoloration of the wood, involving mainly the upper portion of the trunk. The tissues affected were parts of the woody parenchyma, the medullary rays, and some of the vessels, which were occluded by a gummy substance. From a distance of 30 cm. and upwards above soil level the wood was attacked by the boring insect *Xyleborus dispar*, between which and the *Ceratostomella* symbiotic relations may well exist [cf. *R.A.M.*, xiv, p. 68]. The disease is reported to be widespread also on apples in the valleys of Sole and Non and at Madiano de Bergine.

The mycelium and a few fructifications of the fungus were found in the infected tissues. Besides the perfect stage, the organism produces unicellular, variable conidia of the *Cladosporium* type [ibid., xiv, p. 274] and coremia of a *Graphium* (*G. pirinum* G. Goid.). *C. catoniana* is definitely homothallic, none of the 20 monospore isolations having failed to give rise to perithecia. Inoculation experiments will be undertaken to ascertain the degree of pathogenicity of the new species.

Goetz (O.). **Die italienischen Burbank-Pflaumenanlagen durch Graphium ulmi zerstört?** [Are the Italian Burbank Plum plantings destroyed by *Graphium ulmi*?]—*Obst- u. Gemüseb.*, lxxxi, 2, p. 28, 1935.

An article in the *Schweizerische Zeitschrift für Obst- und Weinbau* (No. 1, 1935) states that the extensive Burbank plum plantings in the Romagna, Italy, have been suffering since 1931 from a destructive disease suggesting infection by *Graphium* [*Ceratostomella*] *ulmi* [*R.A.M.*, xiv, p. 133], which threatens to exterminate the entire Burbank cultivation.

[The symptoms described seem closely to resemble those first reported by Goidànich in 1933 [ibid., xiv, p. 320], and in a letter to the Director of the Imperial Mycological Institute, dated 1st April, 1935, Prof. L. Petri categorically refutes the alleged implication of *C. ulmi* as a cause of disease in Burbank plums in Italy.]

Kunkel (L. O.). **Heat treatment for the cure of yellows and rosette of Peach.**—Abs. in *Phytopathology*, xxv, 1, p. 24, 1935.

An apparently permanent cure of peach yellows and rosette [*R.A.M.*, xiv, p. 219] was effected by the incubation of potted trees at a temperature ranging from 34·4° to 36·3° C. for a fortnight or more. Some difficulty was experienced in the destruction of the virus in the roots, due probably to the cooling effect of evaporation in the moist earth. This suggests that the phony peach virus [ibid., xiii, p. 38] may be confined to the underground part owing to the exposure of the upper portions to high summer temperatures.

Mix (A. J.). **The life history of Taphrina deformans.**—*Phytopathology*, xxv, 1, pp. 41–66, 6 figs., 1935.

As in the writer's previous investigations [*R.A.M.*, iii, p. 659], negative results were given by attempts to isolate *Taphrina deformans* from the surfaces of overwintering peach twigs in Kansas. Though there is very strong circumstantial evidence of the presence of the conidia on such twigs, they are overrun by the faster-growing fungi with which

they are associated. Inoculation experiments on young Elberta trees showed that the conidia of *T. deformans* can survive on the twigs and infect the unfolding leaves even after a year. A bagging test showed that the exclusion of the ascospores from the twig surfaces resulted in absence of curl the following spring. The conidia are believed to overwinter, not only on the surfaces of the bud scales, but on those of all parts of the dormant tree [cf. ibid., xiii, p. 452].

Perennial mycelium could not be detected in diseased peach twigs and there is no evidence of this method of survival from one season to the next. The infecting conidia send germ-tubes through the outer walls of the lower leaf epidermis and possibly, in the case of late attacks, through those of the upper one also. Some lateral growth may occur beneath the cuticle. A subepidermal intercellular mycelium is then established and gives rise in the radial epidermal walls to branches constituting the subcuticular hymenium. Asci are occasionally borne on the lower leaf surfaces as well as on the upper one.

In *T. deformans* the dicaryophase normally originates by nuclear division in one conidium, the occasional occurrence of copulation being possibly reminiscent of a once functional process but in no sense a necessary phase in the life-history of the organism. It was further shown by inoculation experiments that infection may be caused by conidia descended from each of the eight ascospores of an ascus, so that conidial copulation is not an essential preliminary to invasion.

It was incidentally ascertained in the course of these studies that the conidia of *T. deformans* are able to infect peach shoots after eleven years in artificial culture, under which conditions also cells of the dicaryophase and diplophase may be formed. The asci produced in culture are frequently abortive, but a few containing ascospores have been observed. Saprophytic growth in culture must be initiated by ascospores or conidia (haploid), the diploid stage in the leaf mycelium failing to grow in culture. Once started, however, the cultures may give diploid cells.

FISHER (EILEEN). **Observations on Fomes pomaceus (Pers.) Big. & Guill. infecting Plum trees.**—*Trans. Brit. mycol. Soc.*, xix, 2, pp. 102–113, 4 figs., 1935.

An account is given of the author's investigation in 1931–2 of *Fomes pomaceus* [*R.A.M.*, vii, p. 648], which is stated to occur frequently on old plum trees in Cambridgeshire. The Pershore variety is generally the most susceptible but in one plantation a large number of Victoria trees were found to be heavily infected. Periodical tests of the germinability of the basidiospores after their liberation from the sporophore indicated that they may retain their viability for as long as 24 weeks when kept dry on glass slides; the mycelium also proved to be very resistant to desiccation, as a fresh culture was obtained from one on a plum wood block after $3\frac{1}{2}$ years.

The results of a microchemical study of the effects of *F. pomaceus* on invaded plum wood supported Brooks's and Storey's view in infection with *Stereum purpureum* [ibid., iii, p. 343] that the copious formation of gum, which is characteristic of the early stages of decay, is associated with removal of starch from the medullary ray cells. They also showed

that the subsequent white rot stage is due not to delignification of the woody elements, as was previously supposed, but to removal of the thick internal layer of the wood fibres, which was shown to be rich in cellulose but devoid of the aldehydes usually associated with lignin. The medullary ray cells are the last to be attacked.

Inoculation experiments with spores and mycelium indicated that *F. pomaceus* is but a weak parasite on plum, and that the Pershore variety is slightly more susceptible than Victoria.

MAGIE (R. O.). **Variability of monosporic cultures of Coccomyces hiemalis.**—Abs. in *Phytopathology*, xxv, 1, pp. 26–27, 1935.

Considerable variations were detected between 20 strains of the cherry pathogen, *Coccomyces hiemalis* [*R.A.M.*, xiv, p. 178], from six States in colony colour and contour, growth rate, acid production, spore formation, and conidial length. Germination occurred over a P_H range from 2·9 to 8·5, while growth and the production of spores on agar took place at temperatures from 4° to 28° C., the optimum for growth being 20° to 24° and for spore production 12° or 16°. Pathogenicity tests with more than a dozen isolations of the fungus on several species of *Prunus* indicated appreciable susceptibility only in sweet and sour cherries, and gave no indication of the occurrence of physiologic forms.

HOAGLAND (D. R.) & SNYDER (W. C.). **Nutrition of Strawberry plant under controlled conditions: (a) Effects of deficiencies of boron and certain other elements: (b) Susceptibility to injury from sodium salts.**—*Proc. Amer. Soc. hort. Sci.*, xxx, pp. 288–294, 5 figs., 1934. [Received March, 1935.]

The results of the experiments reported in some detail in this paper, in which strawberry (Banner and Nich Ohmer) plants were grown in a standard nutrient solution alone and with the addition of various elements, showed that the striking symptoms of malnutrition which developed in the first series were in a large measure caused by deficiency in boron. In subsequent tests, however, it was seen that plants receiving additions of only boron and manganese were distinctly inferior to plants receiving the complete elements in colour, general appearance, and development of runners, suggesting that copper or zinc or both, and perhaps still other elements, were also needed. The experiments further indicated that the strawberry requires much more than a trace of boron for normal growth. Incidentally it was noted that plants growing in the solution to which an enlarged supplementary group of elements had been added were almost completely free from mildew [*Sphaerotheca humuli*] and red spider, while plants without any supplementary elements were very susceptible to both organisms.

The Nich Ohmer variety was shown to be highly sensitive to even moderate concentrations (100 to 500 p.p.m.) of sodium salts, among which sodium sulphate and sodium chloride chiefly caused a marginal burning which sometimes spread until the whole leaf was killed. Plants grown in solutions containing small amounts of sodium bicarbonate showed marked root necrosis and some yellowing of the foliage.

ARNAUD (G.). **Le dépérissement du Cassissier.** [The dying-off of the Black currant.]—*Rev. hort., Paris*, cvi, 10, pp. 228–229, 1934.

A dying-off of black currants prevalent in the Dijon district of France and at Versailles was found to be due to a species of *Phomopsis* only the β spores of which developed in pure culture [cf. *R.A.M.*, iii, p. 433]. Artificial inoculation experiments with the pathogen gave positive results through wounds, but the progress of infection was very slow. Longitudinal sections through diseased branches revealed a grey or light brown discoloration of the wood. The control of this form of dying-off presents considerable difficulty; the diseased material should be excised to a distance of 10 cm. below the infected area and the wound disinfected.

Anthracnose (*Gloeosporium ribis*) [ibid., ix, p. 472] may be effectively combated in the Côte-d'Or by the application of Bordeaux mixture between 15th May and 1st June.

HAHN (G. G.). **Immunity of Viking, a Norwegian Red Currant, to Cronartium ribicola and C. occidentale under greenhouse conditions.**—*Circ. U.S. Dep. Agric.* 330, 16 pp., 1 col. pl., 2 figs., 1935.

A red currant variety from Norway, apparently a hybrid form of *Ribes petraeum*, which is given the new name of Viking (syn. Rød Hollandsk Druerips [Red Dutch Grape Currant]), has proved immune from white pine (*Pinus strobus*) blister rust (*Cronartium ribicola*) in four years' greenhouse testing, in Scotland in 1929 and in the United States from 1930 to 1932 [*R.A.M.*, ix, p. 192]. It has also given evidence of immunity from *C. occidentale* [ibid., ix, p. 570] on *P. monophylla*. None of the Viking plants, numbering about 1,000, set out in close proximity to pines infected by *C. ribicola* in New England, New York, Oregon, and Canada during 1932–3 have hitherto shown any sign of blister rust.

BLODGETT (E. C.). **Pathogenicity and physiology of Pseudopeziza ribis.**—Abs. in *Phytopathology*, xxv, 1, pp. 6–7, 1935.

Studies of 7 isolates of *Pseudopeziza ribis*, the agent of anthracnose of *Ribes* spp., from Wisconsin, Oregon, Canada, and the Netherlands [*R.A.M.*, viii, p. 22; xiii, p. 104] revealed considerable strain differences. The microconidia of isolate 2 were over twice the length of those of isolate 4. The optimum temperatures for conidial and ascospore germination were 20° and 12° C., respectively. The best conidial germination and growth were made at P_H 5·3 to 5·7. Inoculations with conidia, and in a few cases with ascospores, showed that currant strains are more pathogenic to currants than to gooseberry; penetration is effected directly through either leaf surface and all common garden varieties are liable to severe attack. The ascigerous stage was found in profusion on currant and gooseberry.

KADOW (K. J.). **The Raspberry white-bud disease and its relation to bitter rot of Apples.**—*Phytopathology*, xxv, 1, pp. 91–103, 4 figs., 1 graph, 1935.

The Erskine Park and a number of other raspberry varieties in Illinois are liable to a disease known as 'white bud', characterized by a whitish-grey discoloration of the tissues round the lateral buds, which

usually die following premature leaf fall. The lesions always appear to be localized at the point of union of the cane and the leaf petiole. Small *Colletotrichum* acervuli and rudimentary perithecia develop on the spots after defoliation. The conidia measure 11 to 18 by 3 to 7 μ and setae were generally abundant on the raspberry but did not form on inoculated apples. In culture, mature perithecia of a *Glomerella* developed on bean pod agar after six weeks at room temperature.

From a comparative study of the raspberry organism and the closely related agent of apple bitter rot, *G. cingulata* [*R.A.M.*, vii, p. 332], the conclusion was reached that the cultural and morphological differences between the two are such as to warrant specific separation, the former being apparently identical with *G. rubicola* (Ston.) S. & S. Both fungi caused typical bitter rot of Ben Davis and Grimes apples in inoculation tests, but *G. cingulata* gave negative results on Erskine Park raspberry canes. Apples were infected through the unbroken epidermis by atomized suspensions of *G. cingulata* but not by those of *G. rubicola*. The latter caused white bud of raspberries by direct epidermal penetration through the unweathered tissue at the junction of petiole and stem.

Panama disease of Bananas.—*J. Jamaica agric. Soc.*, xxxix, 1, p. 30, 1935.

At a Board meeting of the Jamaica Agricultural Society in January, 1935, the Director of Agriculture called attention to the serious situation existing in the parish of St. Mary, where the Government had approved of the 1-root treatment against Panama disease [*Fusarium oxysporum cubense*: *R.A.M.*, xiv, p. 113]. It now appeared that the provision, which had been specifically retained, whereby no quarantine area could be replanted had been ignored by several growers, thus causing very serious danger of increasing the spread of the disease by disturbing infected soil. In the last 22 years some 20,000 acres in Jamaica had gone out of banana cultivation owing to the ravages of the disease.

Reinking (O. A.). **Soil and Fusarium diseases.**—*Zbl. Bakt.*, Abt. 2, xci, 11–15, pp. 243–255, 1935.

Various diseases caused by species of *Fusarium* appear to be closely correlated with soil conditions [*R.A.M.*, xiii, p. 594]. Banana wilt (*F. oxysporum* f. 3) [*F. oxysporum cubense*: ibid., xiv, p. 323 and preceding abstract], for instance, was found in Panama, Honduras, and Costa Rica to be more severe on sandy than on clay soils, a fact that may assume considerable importance in the formulation of control measures. Evidently the ability of the wilt fungus to persist for lengthy periods as a saprophyte in the soil depends on the constitution of the latter. It is known to persist for ten years in the sandy soils of Costa Rica.

Carter (W.). **Mechanical transmission of two viruses to Pineapple.**—Abs. in *Phytopathology*, xxv, 1, p. 10, 1935.

Mosaic of *Commelina nudiflora* in Hawaii appears to be identical with that described from Florida [*R.A.M.*, xiv, p. 93]. Natural transmission

to pineapple is unknown, but in a few instances infection has been artificially conveyed by needle punctures. The disease is lethal to the pineapple, its symptoms being indistinguishable from those of yellow spot [ibid., xii, p. 304] as shown by a single case of needle transmission of the latter from an infected to a healthy pineapple.

CARTER (W.). **The symbionts of Pseudococcus brevipes in relation to a phytotoxic secretion of the insect.**—Abs. in *Phytopathology*, xxv, 1, p. 10, 1935.

Green spotting of pineapple leaves in Hawaii, a toxic effect of feeding by *Pseudococcus brevipes* [*R.A.M.*, xiii, p. 586], is stated to be invariably associated with the presence in the insect of a bacillus-like symbiont. When the insect colony is transferred from pineapple to *Panicum barbinode*, the green-spotting capacity is lost and at the same time the symbiont gradually disappears. The return of the mealy bug colony to pineapple has hitherto failed to result in the reappearance of the symbiont or the green-spotting property of the insect. Hence it is concluded that the latter is a specific effect of the presence of the associated bacillus.

CHAUDHURI (H.) & SINGH (J.). **A disease of Pomegranate (Punica granatum Linn.) due to Amphichaeta punicae n.sp.**—*Trans. Brit. mycol. Soc.*, xix, 2, pp. 139–144, 1 pl., 1935.

A brief account is given of a disease which was observed on nursery pomegranate plants in Lawrence Garden, Lahore, and was chiefly characterized by the presence on the twigs of innumerable minute erumpent acervuli with a stroma-like stratum without setae, bearing conidiophores abstricting singly somewhat spindle-shaped, 5-septate spores measuring 20 to 27 by 7 to 11 μ, the four inner cells of which are dark and the two terminal ones hyaline and provided each with a sharply curved cilium (usually towards the same side), measuring 6 to 11 μ in length. The fungus was isolated in pure culture and is considered to be a new species of the genus *Amphichaeta*, for which the name *A. punicae* is suggested. A Latin diagnosis is appended. Numerous inoculation experiments showed that it is a weak wound parasite on pomegranate, which it seldom kills in nature though considerably stunting the growth of the tree.

SCHNICKER (J. L.). **Kemikaliekontrollen i 1934.** [Inspection of chemical substances in 1934.]—*Tidsskr. Planteavl*, xl, 3, pp. 476–490, 1934.

Notes are given on the various offences against the Danish plant protective and poison laws detected in the course of official inspection in 1934 of some 225 samples of fruit tree carbolineum, lime-sulphur, Bordeaux paste and dusts, organic copper- and mercury-containing, and nicotine preparations. In 52 cases it was deemed necessary, in consultation with the public health authorities, to notify the police concerning these infringements, with the result that a number of fines were imposed, ranging from Kr. 20 to 100.

Pflanzenschutzmittelverzeichnis des Deutschen Pflanzenschutzdienstes 1935. Mittel gegen Pflanzenkrankheiten, Schädlinge und Unkräuter. [List of plant protectives of the German Plant Protection Service 1935. Preparations for the control of plant diseases, pests, and weeds.]—*Biol. Reichsanst. Land- u. Forstw., Berl.-Dahl., Merkbl.* 8–9 (10th Ed.), 15 pp., 1935.

Alphabetical lists are given of the preparations officially recognized by the German Plant Protection Service as effective against weeds, plant diseases, and pests (excluding seed-grain disinfectants which form the subject of a separate communication) [*R.A.M.*, xiv, p. 20].

Trappmann (W.). **Schädlingsbekämpfung und Wirtschaftslage. I. II.** [Pest control and the economic situation. I. II.]—*Chem. Z.*, lix, 1, pp. 14–15; 2, pp. 29–30, 1935.

Certain aspects of the agricultural pest control problem are briefly discussed in relation to the present economic situation in Germany.

In connexion with one of the most important branches of plant protection, namely, cereal seed-grain disinfection, it is mentioned that only one (formaldehyde) of the ten liquid disinfectants now officially recommended by the Plant Protection Service for the treatment of wheat bunt [*Tilletia caries* and *T. foetens*] is free from mercury, and only one of the five dusts [*R.A.M.*, xiv, p. 20], all efforts to find a substitute for this costly substance with its attendant risks to health [ibid., viii, p. 300; ix, p. 234] having hitherto failed. The best of the mercury preparations have the advantage of controlling not only wheat bunt, but also the three other chief cereal diseases, viz., loose smut of oats [*Ustilago avenae*], snow mould [chiefly of rye: *Calonectria graminicola*], and barley stripe [*Helminthosporium gramineum*]. Of steadily increasing importance in the business of seed-grain disinfection are the co-operative plants with continuously working apparatus now being established in many parts of the country [ibid., xiii, p. 89].

Hitherto only 60 to 70 per cent. of the total amount of copper sulphate produced annually in Germany (20,000 tons) has been consumed in the home market, the remainder being exported [cf. ibid., ix, p. 118]. It is to be hoped that the quantity of copper sulphate annually required for viticultural purposes (7,000 to 10,000 tons) will continue to be forthcoming, the substitutes employed during the world war, such as peroxide, having proved practically useless. Lime-sulphur is used to a considerable extent in the orchard, especially in humid climates like those of the Lower Elbe and the Lake of Constance, where copper-containing mixtures are liable to cause burning, while sulphur dust or colloidal sulphur preparations are employed against various mildews and the latter as a dormant spray in the orchard. Some 28,000 tons of sulphur being produced annually in Germany, no shortage in the local supply need be feared.

Taubenhaus (J. J.) & Decker (P.). **Laboratory and field studies on sulphur as a fungicide.**—Abs. in *Phytopathology*, xxv, 1, pp. 35–36, 1935.

Sulphurs of a 300-mesh fineness were shown by laboratory studies to be highly inhibitory of spore germination of pathogenic fungi [*R.A.M.*,

ix, p. 664], an effect that may be considerably increased by the addition of small percentages of other standard disinfectants. Sulphur may thus find a valuable use as a carrier in place of the inert material now employed in certain fungicidal and insecticidal dusts. Fair control of potato scab [*Actinomyces scabies*] in Texas was given by the application of sulphur in the furrows with the seed pieces, though not by scattering it broadcast. The passage of *Phymatotrichum* [*omnivorum*: see above, p. 360] from an infected to a healthy area was absolutely barred by the incorporation with the soil of 2 to 4 per cent. sulphur or by pure sulphur slabs.

GOLDSWORTHY (M. C.) & GREEN (E. L.). **Availability of copper in Bordeaux mixture residues and its absorption by conidia of Sclerotinia fructicola.**—Abs. in *Phytopathology*, xxv, 1, p. 17, 1935.

The available copper in 2–4–50 aged and weathered Bordeaux mixture residues and that absorbed within the germ-tubes of *Sclerotinia fructicola* were determined by the use of nitroso-chromotropic acid. The available copper in such residues was found to amount to at least 4 p.p.m. by volume of the original mixture and to be lethal to germinating and germinated conidia, the growth of which was retarded by smaller quantities of available copper. Once the available copper is washed away, the germinating conidia cannot restore the supply from the remaining insoluble residue, this process being apparently effected by weathering.

KEITT (G. W.) & PALMITER (D. H.). **Fungicidal properties of certain copper-lime-arsenite preparations.**—Abs. in *Phytopathology*, xxv, 1, pp. 23–24, 1935.

The toxicity of copper sulphate, lime, and certain arsenites (especially calcium) in water was studied by a standardized cultural technique in which ten plant pathogens were incubated on plates of malt agar containing the disinfectants. Mono-, di-, and tricalcium arsenite [cf. *R.A.M.*, xii, p. 559], each used alone, were found to equal or exceed copper sulphate in toxicity. The fungicidal efficacy of copper sulphate-lime-calcium arsenite mixtures equalled or surpassed the additive toxicities of the copper sulphate and calcium arsenite used in them, and the toxic materials, as well as those from each of the calcium arsenites used alone, diffused through the agar (especially in initially acid media), whereas the copper-lime component used alone showed no fungicidal action by diffused compounds in alkaline and very little in neutral or slightly acid media.

ROBERTS (J. W.), PIERCE (L.), SMITH (M. A.), DUNEGAN (J. C.), GREEN (E. L.), & GOLDSWORTHY (M. C.). **Copper phosphate mixture: a promising fungicide.**—Abs. in *Phytopathology*, xxv, 1, pp. 32–33, 1935.

Good control of mild to moderately severe cases of apple scab [*Venturia inaequalis*], cherry leaf spot [*Coccomyces hiemalis*: see above, p. 376], and *Fabraea* leaf blight of pears [*F. maculata: R.A.M.*, xii, p. 231] were obtained in field trials during 1933–4 by spraying with a mixture of 2 lb. copper (tricupric) phosphate, 2 lb. bentonite, and 4 lb.

hydrated lime in 50 galls. water [ibid., xiii, p. 812 and next abstract]. The fruit of certain varieties was slightly russeted by the treatment, but no other injury was caused.

YOUNG (H. C.) & BECKENBACH (J. R.). **Insoluble copper compounds as substitutes for Bordeaux.**—Abs. in *Phytopathology*, xxv, 1, p. 40, 1935.

Lack of adhesiveness, the major limitation of copper oxychloride, copper phosphate [see preceding abstract], and coposil [*R.A.M.*, xiv, p. 150] has been found to be largely remediable by the use of bentonite and a specially treated clay known as wyojel. The most effective of the formulas so far tested with promising results on cucurbits in northern Ohio is 1 lb. copper compound, 5 lb. filler, and 1 lb. calcium or lead arsenate. The results of preliminary trials on potatoes and celery indicated that the fungicidal value was decreased by the addition of lime. All these copper compounds caused severe russeting of apples under local conditions.

HORSFALL (J. G.) & HAMILTON (J. M.). **Some fungicidal possibilities of red copper oxide.**—Abs. in *Phytopathology*, xxv, 1, p. 21, 1935.

Continued trials with red copper (cuprous) oxide [at the New York (Geneva) Agricultural Experiment Station: *R.A.M.*, xiv, p. 218] demonstrated its utility in the control of seed decay, oat smuts [*Ustilago avenae* and *U. kolleri*], wheat bunt [*Tilletia* (?) *foetens*], apple scab [*Venturia inaequalis*], tomato early blight [*Alternaria solani*: ibid., xiii, p. 195], rose mildew and black spot [*Sphaerotheca pannosa* and *Diplocarpon rosae*], and snowberry anthracnose [*Sphaceloma symphoricarpi*: ibid., xii, p. 661]. Generally speaking, it was as safe as Bordeaux mixture, the tendency to injure copper-sensitive plants being reduced, without impairing efficacy, by the addition of lime or cotton-seed oil emulsion. Red copper oxide is strongly adhesive and persistent through rain since it is highly insoluble, is composed of small particles, and probably bears a positive electric charge. Objectionable spray residues are almost eliminated by the high copper content of the molecule. The cheap cuprous ion in cuprous oxide appears to be more toxic to the organisms tested than the cupric ion in general use. Red copper oxide seems to be compatible with the standard insecticides.

HORSFALL (J. G.). **Zinc oxide as a seed and soil treatment for damping-off.**—*Bull. N.Y. St. agric. Exp. Sta.* 650, 25 pp., 6 figs., 1934. [Received March, 1935.]

This is a full account [an abstract from which has already been noticed; *R.A.M.*, xiii, p. 388] of experiments at Geneva, New York, the results of which showed that surface applications of zinc oxide at the rate of one-half to one ounce per square foot of ground are a durable means for the control of post-emergence damping-off (*Pythium ultimum*), but should be used as a supplement to seed treatment with red copper oxide [see preceding abstract] for the control of the pre-emergence phase of the disease. As zinc oxide penetrates the soil very poorly it is not effective against pre-emergence damping-off, and furthermore, the seed should not be sown deeper than ¼ inch and the layer of the substance

over the surface should not be disturbed by cultivation until the danger of damping-off is over. Mixing zinc oxide with the surface soil before sowing is not feasible because the dose necessary for disease control is toxic to roots with which it comes in actual contact. In some localities damping-off of transplants was controlled by dusting the foliage of the transplants, immediately after they were set in place, with zinc oxide, and then brushing it off the leaves before rinsing into the soil; this treatment should be applied on cool, cloudy days or late in the afternoon. In 1934 it gave satisfactory control without excessive injury to such plants as tomato, eggplant, chillies, celery, snapdragon, beet, salvia, and wallflower in certain counties, and was stated to control the trouble on rhododendron cuttings, while rhododendron seedlings were injured in a greenhouse in another locality.

While in general zinc oxide appeared to be less effective than red copper oxide when used for seed treatment, it was more effective than the latter for some seeds, particularly crucifers and lettuce in certain localities, and it compared favourably with semesan on cabbage seed at Geneva.

Dorph-Petersen (K.). **Beretning fra Statsfrøkontrollen for det 63. Arbejdsaar fra 1. Juli 1933 til 30. Juni 1934.** [Report of the State Seed Testing Service for the 63rd year of activity from 1st July, 1933 to 30th June, 1934.]—*Tidsskr. Planteavl*, xl, 3, pp. 399–459, 1934.

Section vi of this report (pp. 435–6) contains a few items of phytopathological interest regarding the presence of seed-borne parasitic fungi in seed samples in Denmark [cf. *R.A.M.*, xii, p. 294], none of which calls for special mention.

Canna (S.). **Ricerche sulla flora micologica dei lieviti della panificazione.** [Studies on the mycological flora of the leavens used in breadmaking.]—*Boll. Soc. ital. Biol. sper.*, ix, 4, pp. 335–337, 1934.

The following organisms were isolated from numerous samples of natural leavens obtained from various sources in Tuscany: *Actinomyces albus* [*R.A.M.*, xi, p. 325], *Saccharomyces cerevisiae* [ibid., viii, p. 778; xiv, p. 306], *S. minor*, *Aspergillus calyptratus* var. *italicus*, *Coremium* [*Penicillium*] *glaucum*, *Cryptococcus* sp., *Enantiothamnus braulti* Pinoy [ibid., xii, p. 288; cf. also xiii, p. 186], *Geotrichum candidum* [ibid., ix, p. 201], *Monilia candida* [*Candida vulgaris*], *M. lustigi* Cast., *P. crustaceum*, and *Sterigmatocystis nigra* [*A. niger*]. The so-called 'compressed' or 'selected' leavens (Italian and foreign), supplied by sugar and alcohol factories and consisting of actively fermenting cultures of *Saccharomyces cerevisiae* on cereal or other starchy media, also contained *G. candidum*, a red pigmented strain of *Cryptococcus*, *Monosporium spinosum*, *P. glaucum*, and *Trichosporium fuscum*. Fermentation of various sugars with gas production was effected by ten of the abovementioned species.

Bisby (G. R.). **Are living spores to be found over the ocean?**—*Mycologia*, xxvii, 1, pp. 84–85, 1935.

During a voyage from Montreal to London occupying the period from

25th May to 4th June, 1934, the writer exposed Petri plates with a view to determining the incidence of living fungal spores over the sea. After leaving the St. Lawrence River and Gulf, which yielded three or four [unspecified] micro-organisms, no fungi were caught on the plates until the south coast of Ireland was reached on 2nd June; of the four then secured, one was *Botrytis cinerea* and the other *Phoma* (?)*hibernica* [ibid., xiii, p. 97]. Further [undetermined] organisms developed from plates exposed in the English Channel.

It would appear from these data that the scarcity of micro-organisms over the sea is such as to necessitate special arrangements for the protracted exposure of plates and slides.

MEIER (F. C.). **Micro-organisms in the atmosphere of Arctic regions.**—Abs. in *Phytopathology*, xxv, 1, p. 27, 1935.

On the Lindbergh Atlantic Survey Flight of 1933, 26 collections of organisms present in the atmosphere at various altitudes over stretches of water and ice between Maine and Denmark were obtained on specially prepared slides. The results showed an abundance of certain spore types in the air currents over Maine and Labrador, diminishing with the leeward progress over Davis Strait, the great ice cap of Greenland, and Denmark Strait [cf. *R.A.M.*, xiv, p. 326, and preceding abstract].

BABEL (A.). **Infrarot-Photographie im Pflanzenschutz.** [Infra-red photography in plant protection.]—*Angew. Bot.*, xvii, 1, pp. 43-53, 9 figs., 1 graph, 1935.

The application of infra-red photography [*R.A.M.*, xiii, p. 47] to the study of plant diseases is discussed in connexion with some typical examples, and the principles and technique of the process are fully described.

RIVERA (V.). **I virus filtrabili nella patologia vegetale.** [Filterable viruses in plant pathology.]—*Mem. R. Ist. sup. agr. Perugia* 45, 47 pp., 4 figs., 1934.

After discussing the nature of virus diseases and the effects exercised upon them by the temperature of the air and other environmental conditions, the author describes a series of experiments in which young leaves of healthy Kentucky tobacco plants were inoculated with *Bacterium tumefaciens* and the virus of Dickson's and Vanterpool's tomato streak (a mixture of tobacco mosaic and the latent potato virus) [*R.A.M.*, xii, p. 333; xiv, p. 201] singly and together. Inoculations with the viruses alone produced streak symptoms only, those made with the bacterium alone or the bacterium with the juice of an apparently healthy tobacco plant led to the formation of galls, while those made with *Bact. tumefaciens* and the streak viruses (in the same wound) gave symptoms of virosis followed by an extremely rapid formation of galls bearing normally growing tobacco shoots. When well-formed, actively growing galls were painted with the juice expressed from streak-diseased tobacco plants their growth was arrested and their size reduced, the streak virus mixture exercising a necrotic effect on the gall tissues. Spectroscopic

examination showed that the juice from streak-diseased tobacco plants was unable to absorb ultra-violet rays.

CHESTER (K. S.). **Serological evidence in the study of the relationships of certain plant viruses.**—Abs. in *Phytopathology*, xxv, 1, p. 10, 1935.

So close is the serological relationship between twenty-five yellow, white, necrotic, symptomless, and ordinary strains of the tobacco mosaic virus that they may be regarded merely as minor variants of a single type. To the same serological group belong also aucuba mosaic of tobacco and Johnson's virus No. 6 [*R.A.M.*, xiv, p. 261]. Cucumber mosaic and tobacco ring spot, both entirely distinct from tobacco mosaic, are readily distinguishable from one another by the neutralization test, and each comprises strains closely related serologically among themselves [ibid., xiv, p. 245]. The latent virus of potato [ibid., xiv, p. 261 and preceding abstract] differs serologically from all the above-mentioned viruses, and is very closely allied to potato ring spot, mottle [ibid., xii, p. 588; xiii, p. 319], and British Queen streak [cf. ibid., xiii, p. 329], the three last-named behaving as strains of the latent virus. The veinbanding [ibid., xiv, p. 190] and aucuba mosaic [ibid., xii, p. 585] potato viruses were found to be entirely distinct both from each other and from all those mentioned above.

HARRISON (A. L.). **The effect of mosaic on transpiration of the Bean.**—Abs. in *Phytopathology*, xxv, 1, p. 18, 1935.

The rate of transpiration in mosaic Stringless Green Pod Refugee beans (*Phaseolus vulgaris*) [*R.A.M.*, xiv, p. 72] in New York was found to be significantly less per unit of surface area and dry weight than in healthy plants. The rate was slower in leaves with primary symptoms than in those with secondary ones, and in the light than in the dark green areas. The rate in leaves formed before infection was not altered. Detached pods from diseased plants transpire more rapidly per unit of surface area and fresh weight than those from healthy ones.

BALDACCI (E.). **L'immunità acquisità attive nella piante superiore: I. Esperienze di vaccinazione. II. Ricerche sulla vaccinazione e sui liquidi usati come vaccini. III. Critica del concetto di vaccinazione e dei procedimenti tecnici.** [Acquired active immunity in the higher plants. I. Vaccination experiments. II. Studies on vaccination and on the liquids used as vaccines. III. A critique of the concept of vaccination and of the technical methods.]—*Boll. Soc. ital. Biol. sper.*, ix, 8, pp. 744–746; 10, pp. 1232–1235, 1934.

Rice seedlings were subjected [by methods similar to those previously described: *R.A.M.*, xii, p. 779] to artificial immunization against *Corticium centrifugum*, *C.* (*Sclerotium*) *rolfsii* [ibid., xiv, p. 196], and three strains of *S. oryzae* [*Leptosphaeria salvinii*: ibid., xiii, p. 653]. In general, the results of these tests can hardly be considered to support the claims in favour of vaccination advanced from various quarters [cf. ibid., xiv, p. 188]. Such benefit as accrued to the treated plants (mainly from the mycelial extracts of the fungi, though the filtrate was also effective in the case of *C. centrifugum*), was of a purely transitory nature

and did not prevent their collapse simultaneously with, or even before, the untreated controls. A statistical analysis of the experimental data indicates a positive result in favour of the vaccinated plants on the tenth day in the cases of *C. centrifugum*, *C. rolfsii*, and *L. salvinii* (strain II), whereas on the twentieth day only the plants treated with *C. rolfsii* were in slightly better condition than the controls.

In a further test, in which rice seedlings were grown after vaccination and inoculation in Sachs's medium plus saccharose without agar, an enhanced degree of resistance as compared with the controls was temporarily shown by those treated with the filtrate (1:100) of *C. centrifugum*. In tests with *L. salvinii* (strain I.M.I. from the C. v. S., Baarn) all the plants died at the same time, while in those with the other organisms the controls were the last to succumb. In a third trial the seedlings were grown for indefinite periods in the vaccines: on the thirtieth day the incidence of mortality was 41 per cent. for *C. rolfsii*, 41·6 per cent. for *L. salvinii* II, 53·8 per cent. for *C. centrifugum* and *L. salvinii* I.M.I.; and 61 per cent. for Curzi's strain of the last-named fungus; on the fiftieth day 84 per cent. of the plants were dead. Calculating by dilutions, the mortality on the thirtieth day among the plants treated with the 1:10 concentration was 71·4 per cent., the corresponding figures for 1:50, 1:100, and mycelial extract (1:100) being 40, 13·3, and 68 per cent., respectively.

In connexion with a brief discussion on the theory and practice of vaccination (with special reference to absorption of the vaccines through the root system), the writer propounds the hypothesis that the resultant temporary retardation of decay is associated with diminished transpiration and a consequent prolongation of the turgor necessary for mechanical resistance to hyphal penetration [cf. ibid., vii, p. 799].

SMITH (ELIZABETH C.). **Effects of ultra-violet radiation and temperature on Fusarium. I. Lethal action.**—*Bull. Torrey bot. Cl.*, lxii, 1, pp. 45–58, 2 graphs, 1935.

As a result of her experiments with water suspensions of *Fusarium eumartii* spores, the author states that the death rates of the spores subjected to ultra-violet radiation [cf. *R.A.M.*, xii, p. 316] at different temperatures took the form of sigmoid curves which rapidly approached the logarithmic type as the temperature was increased, a factor which increased the lethal effect of the radiation especially on the least resistant spores. The average temperature coefficients between 0° and 40° C. and between 40° and 50° (1·13 and 1·37, respectively) are characteristic of a physical or photochemical reaction, with an indication that temperature, besides a sensitizing effect, has also a lethal action in conjunction with ultra-violet radiation, in the presence of which its effect is relatively constant. The mycelium of *F. eumartii* was shown to be less sensitive to the radiation than the spores, but no difference in this respect was observed between germinating and resting spores.

It is suggested that in such tests sigmoid curves are due to chance variation in resistance of the spores to the lethal agent, and that logarithmic curves are only modified sigmoid curves in which the death-rate has increased most for the least resistant spores.

Carter (J. C.). **Growth association of micro-organisms.**—Abs. in *Phytopathology*, xxv, 1, p. 9, 1935.

Helminthosporium sativum, *H. inaequale* [*Curvularia inaequalis* (Shear) Boedijn], *Sclerotinia americana* [*S. fructicola*], *Glomerella cingulata*, *Gibberella saubinetii*, *Fusarium moniliforme* [*G. moniliformis*], *F. conglutinans*, and *F. lycopersici* were each grown in culture on potato-dextrose agar with various bacteria, *Aspergillus niger*, and two strains of *Penicillium* [cf. *R.A.M.*, xii, p. 109] as inhibitors. *A. niger* was the only one of the inhibitors to produce even a slight retardatory effect on *G. moniliformis*, while *F. conglutinans* and *F. lycopersici* also proved refractory to inhibition by other organisms. *H. sativum* was the most sensitive of the fungi, being inhibited at a distance of 15 to 25 mm. by three bacteria and *A. niger*, the corresponding figures for *C. inaequalis* and *S. fructicola* being 10 to 15 and 5 to 10 mm., respectively.

Goto (K.). **Observations on spore discharge in perfect stage of Sclerotium rolfsii Sacc.**—*J. Soc. trop. Agric. Taiwan*, vi, pp. 609–618, 2 diags., 1934.

The basidiospores of the perfect stage of *Sclerotium rolfsii* [*R.A.M.*, xiv, p. 125 and below, p. 399] were observed to be violently discharged from the sterigmata to a distance of about 0·2 mm. A simple apparatus was devised for the continuous recording of the spore discharge, the periodicity of which was found to reach a maximum at a time distant from noon and a minimum round about mid-day. Spore discharge is more profuse at 15° to 21° than at 22° C., while at 34° it no longer occurs. The process is dependent on a high degree of atmospheric humidity; even at 97 per cent. it declines during the second twelve hours, while at 75 per cent. it ceases after four or five.

Wartenberg (H.), Klinkowski (M.), & Hey (A.). **Der Tagesparzellenversuch. Beiträge zur Methodik der Kartoffelabbauforschung.** [The day plot experiment. Contributions to the technique of Potato degeneration research.]—*Angew. Bot.*, xvii, 1, pp. 74–94, 2 graphs, 1935.

An explanatory account is given of the so-called 'day plot experiment', a development of the 'origin test' forming the basis of ecological potato degeneration research in Germany [*R.A.M.*, xiv, p. 54]. From May to August, 1933, healthy material of the Magnum Bonum and Parnassia varieties was planted out at two- to three-day intervals, the tubers harvested in the autumn, and planted out in the following spring. The resulting stands showed differences in the amount of basal roll, leaf roll, and crinkle coinciding with the variations in the absolute atmospheric humidity prevailing during the planting times in the previous year.

Potato degeneration is considered to be a complex pathological manifestation, the expression in the first instance of a physiological disease—a metabolic anomaly induced by environmental conditions. In certain varieties this disordered metabolism is sufficient in itself to produce progressive degeneration and eventual death, which may be averted, however, before the final stages are reached, by the provision of a suitable environment. It may be assumed that potato plants

weakened by a primary physiological disease are predisposed to attack by infectious viruses. Certain varieties, however, appear to possess, even in a physiologically pathological condition, inherent immunity from virus infection. Potato degeneration may thus eventually result from a leaf roll arising from ecological conditions and a virus component.

Köhler (E.) & Hey (A.). **Untersuchungen an Kartoffelproben über die Beziehungen zwischen Knollenpotential und Virusbefall.** [Investigations on Potato samples on the correlations between tuber potential and virus infection.]—*Zbl. Bakt.*, Abt. 2, xci, 11–15, pp. 256–267, 1 fig., 1935.

Further experiments [the results of which are discussed and tabulated] on the application of Wartenberg's and Hey's potentiometric method to the diagnosis of degeneration diseases of the potato [*R.A.M.*, xiii, p. 649] substantiated previous data as to the validity of this mode of testing. The cause of alteration in the potential lies, not in the virus itself, but in the metabolic disturbances which it induces in the tuber [cf. ibid., xiv, p. 328]. Judging by the outcome of these trials on the Industrie, Magnum Bonum, Klein-Spiegeler Wohltmann, and Preussen varieties, the most prevalent and important viruses in Germany are leaf roll and mosaic of the X and Y groups (ring and streak) [ibid., xiii, p. 797].

Köhler (E.). **Mischinfektionen mit verschiedenen Stämmen des Ringmosaikvirus (X-Virus-Gruppe) der Kartoffel. (Untersuchungen über die Viruskrankheiten der Kartoffel. IV. Mitteilung.)** [Mixed infections with various strains of the ring mosaic virus (X virus group) of the Potato. (Investigations on the virus diseases of the Potato. Note IV.)]—*Angew. Bot.*, xvii, 1, pp. 60–74, 5 figs., 1935.

It has previously been shown [*R.A.M.*, xiii, p. 462] that tobacco and other Solanaceae when systemically infected by a weak strain of the ring mosaic (X) virus [ibid., xiv, p. 327] do not ordinarily contract infection from another, stronger strain of the same group. Further experiments were carried out to ascertain the extent of this protective mechanism and the possibilities of its failure under certain conditions.

Samson Turkish tobacco plants were inoculated either by rubbing the leaves with a glass spatula dipped in the virus (Samuel's method) [ibid., xi, p. 334], or by grafting. The following strains were used as inoculum: Ers. 25 from a healthy Duke of York (Erstling) potato, characterized by the extreme brilliance of the large, milky-white mosaic areas and virtual absence of necrosis, presumably identical with K. L. Koch's mottle virus [ibid., xii, p. 588]; Mb. 12, an exceptionally weak strain from Magnum Bonum, producing after the lengthy incubation period of 18 days a very inconspicuous mottling, largely masked during the winter (ring spot type) [loc. cit.]; and H. 19 described in the previous paper.

Mb. 12 was found to exert a well-marked protective action against H. 19 in the rubbing tests, but it was powerless to counteract the more virulent strain in cases where scions permeated with Mb. 12 were grafted on stocks heavily infected with H. 19. Evidently the protective mechanism of the first virus breaks down under conditions affording the second

direct access to the phloem. It was shown by further rubbing experiments that Mb. 12 is also incapable of immunizing the plants against Ers. 25, while H. 19 likewise maintained its virulence in the presence of Ers. 25. In these cases the lack of protection may be due to the inclusion of two types (mottle and ring spot) within the ring mosaic (latent) virus, Ers. 25 representing the former and H. 19 and Mb. 12 the latter, the immunizing capacity of each type being strictly specific.

ESMARCH (F.). **Die Eisenfleckigkeit der Kartoffeln.** ['Eisenfleckigkeit' of Potatoes.]—*Kranke Pflanze*, xii, 1, pp. 7–10, 1935.

The writer summarizes the available information in respect of 'Eisenfleckigkeit' of potatoes [*R.A.M.*, xiv, p. 117], with special reference to the investigations of Meyer-Hermann in Germany [ibid., xii, p. 652].

DARLING (H. M.), LEACH (J. G.), & KRANTZ (F. A.). **Scab resistance in Potato seedlings.**—Abs. in *Phytopathology*, xxv, 1, pp. 13–14, 1935.

Resistance to scab (*Actinomyces scabies*) in the potatoes commonly grown in the United States [*R.A.M.*, xiv, p. 118] occurs only in those with thick or russet skins, but a series of tests in Minnesota during the last three years showed that some smooth- and thin-skinned inbred seedlings of varying origin also possess this character. Histological studies denote that resistance is closely connected with the capacity for suberization in the lenticels and the type of cells in the latter, the smaller and more compact cork cells apparently conducing to resistance [cf. ibid., xi, p. 69]. Some of the inbred resistant seedlings yielded almost exclusively resistant offspring, but others, as well as some susceptible seedlings, gave both resistant and susceptible plants.

BRAUN (H.). **Erbanalytische Studien über das Verhalten der Kartoffel gegenüber Synchytrium endobioticum (Schilb.) Perc.** [Genetic-analytical studies on the reaction of the Potato towards *Synchytrium endobioticum* (Schilb.) Perc.]—*Angew. Bot.*, xvii, 1, pp. 54–59, 1935.

The 4,413 potato seedling strains tested by the writer at Berlin-Dahlem for their reaction to wart disease (*Synchytrium endobioticum*) may be divided into three groups. The first (susceptible × susceptible) comprised 22 families, of which 16 originated through selfing and 6 by crossing among a number of standard varieties. In most of the families (including all the crosses) susceptible strains predominated in the progeny, two crosses, in fact, yielding exclusively susceptible offspring. There is thus no doubt that certain varieties are homozygous for susceptibility, but it is equally clear that Jørstad and Lunden are incorrect in their assertion that susceptible varieties produce nothing but susceptible progeny [*R.A.M.*, xi, p. 669; xiv, p. 252]. In certain families there may be a considerable number of resistant individuals—exceeding in some cases that of the susceptible. This interpretation of the data is in line with Salaman's and Lesley's assumption [ibid., iii, p. 170] as to the two types of susceptible strains, viz., those yielding only susceptible offspring and others producing a smaller or larger number of resistant seedlings.

The second group (resistant × resistant) contained 40 families (28 selfed and 12 crosses), and in this case the observations of Salaman and

Lesley regarding the occurrence among the progeny of exclusively resistant types could not be confirmed. The majority of the F_2 families were composed to the extent of 50 per cent. or more of resistant individuals, but in eight less than half the offspring were resistant—only 24·6 per cent. among the 73 strains of Switez.

In the third group (resistant × susceptible) resistance and susceptibility were about equally balanced in the progeny.

Briefly discussing these data in connexion with the problem of the genetic constitution of the potato, the writer emphasizes the impossibility of drawing a definite conclusion on the basis of insufficient material. The results hitherto obtained, however, incline him to support K. O. Müller's polyploid hypothesis, framed on the outcome of his studies on resistance to *Phytophthora* [*infestans*: ibid., x, p. 546].

Müller (K. O.). **Über den augenblicklichen Stand unserer Kenntnisse zur biologischen Spezialisierung des Krautfäuleerregers der Kartoffel (Phytophthora infestans).** [On the present position of our knowledge of the biological specialization of the agent of Potato late blight (*Phytophthora infestans*).]—*Züchter*, vii, 1, pp. 1–12, 1 map, 1935.

After summarizing the results of previous studies on biologic specialization in *Phytophthora infestans* in Germany [*R.A.M.*, xiii, p. 259], the writer describes further investigations on the reaction to the now well-established A and S forms of the fungus of (1) the so-called central European assortment of some 360 standard potato varieties (German and foreign); (2) Broili's Ef strain [ibid., xiii, p. 53], the ancestor of the W potato races; and (3) the important breeding species *Solanum demissum* and its hybrids with cultivated types.

Five strains of these biologic forms of *P. infestans* were tested on tubers of the standard assortment, three A and two S types. With one exception (a cross between a W and a cultivated form), all the commercial varieties proved more or less susceptible to both A and S; on tubers of Odenwälder Blaue, however, the A types produced rapid necrosis of the tissues and diminished sporing, resembling the effect found at times to be caused by this type in the W varieties. Some of the A types attacked the tubers of semi-resistant W_2 and W_3 groups with varying degrees of severity (though the fungus fructified sparingly), but in all cases they caused little or no damage to those of the highly resistant W_1 group. None of the W forms, however, showed any conspicuous degree of resistance to the S type; they cannot, therefore, be used in the development of S-resistant strains. Very different results, on the other hand, were obtained with *S. demissum* and its F_1 hybrids with cultivated varieties [ibid., xiii, p. 652], which uniformly showed a high degree of resistance to both the A and S types.

At least two biotypes were found to be comprised in the isolations of *P. infestans* from tomato, of which one (T) is stated to represent an entirely new form, behaving like A on potato but attacking all varieties of tomato hitherto tested with much greater severity than the potato strains. The second form (L) isolated from tomato causes relatively mild symptoms on its own host, moderate infection on cultivated potatoes, and little or none on the W forms, whence it is inferred to be identical with A.

Sporangial development is more profuse than aerial mycelial growth in representatives of the A group, while in S the relationships are exactly reversed.

The examination of potato samples from over 450 localities in Germany showed that the A type (including those forms capable of attacking W_2 and W_3 tubers but not foliage) predominates throughout the country. The S type occurs in seven localities of Pomerania, Bavaria, and the Odenwald, of which three were known in 1932 and the rest discovered in 1933; in all these regions the W forms have been in cultivation for fairly lengthy periods. As far as can be judged on the basis of available information, type A also predominates in the United States, Holland, England, and Japan.

From the standpoint of practical potato breeding, the fact that the W forms are liable to infection by the S type of *P. infestans* disqualifies them from further extensive cultivation as a solution of the late blight problem. There are possibilities, however, in hybridization between *S. demissum* and the cultivated potato and perhaps also in other lines of approach requiring further investigation.

ORTH (H.) & LEHMANN (H.). **Über Degenerationserscheinungen bei Phytophthora infestans.** [On degeneration phenomena in *Phytophthora infestans*.]—*Züchter*, vii, 1, pp. 12–16, 6 graphs, 1935.

Full details are given of observations and inoculation experiments with two German strains of *Phytophthora infestans* (A type) [see preceding abstract] showing that protracted culture of the fungus on potato tubers leads to a marked decline in viability proportionate to the duration of growth on a comparatively uncongenial substratum. Normal germinative capacity may be restored by transference of the cultures to foliage, a process that is absolutely essential to the success of inoculation experiments whenever viability sinks below 50 per cent. To this end the capacity of the sporangia in tuber cultures for zoospore formation should be regularly tested.

CROSIER (W.) & REDDICK (D.). **Some ecologic relations of Phytophthora infestans.**—Abs. in *Phytopathology*, xxv, 1, p. 13, 1935.

The most important external factors in the rapid dissemination of potato late blight (*Phytophthora infestans*) are temperature and humidity [*R.A.M.*, xiii, p. 724]. A relative humidity of 95 per cent. or above must be maintained for some eight hours to permit the formation of viable sporangia; and it must persist for at least eleven or twelve hours, with liquid water and temperature optima for germination, swarming, and infection at the proper moments, to allow of infection taking place. Aerial transmission of the spores cannot explain the spread of the disease over vast tracts. The direct infection of new tubers from diseased seed pieces occurs in sufficient amount to account for the wide prevalence of *P. infestans* following a year of no foliage attack.

DENNISTON (L. T.). **The relation of spraying and disease-free seed to high yields in Pennsylvania.**—*Amer. Potato J.*, xii, 1, pp. 14–18, 1935.

The writer tabulates and discusses the results of his analyses of ten

years' statistics (1925–34) on the relation of spraying and healthy seed to high potato yields in Pennsylvania.

The number of spraying apparatus in use in the State is 12,000; dusting is practised by a small number of growers, but the difference of 50·3 bushels per acre on 35 demonstrations in favour of spraying accounts for the wider popularity of liquid treatment. The average increase in yield on 2,713 spray demonstrations during the past 17 years has been 83·3 bushels per acre, while 771 in the last ten years gave slightly over 100. These results are stated to have been almost as consistent in dry years, such as 1934, with little or no late blight [*Phytophthora infestans*], as in epidemic seasons.

During the period 1919–34 the average increase in yield per acre on 2,446 demonstrations as a result of using disease-free seed was 51·2 bushels (25·4 per cent.).

The average number of sprays applied by all persons obtaining over 400 bushels per acre from 1925 to 1934 was 10·1, the corresponding figures for over 500, over 600, ten extra high yields, and the State record yield being 11·7, 13·3, 14·6, and 13, respectively. The average pressures for the five groups were 302, 345·1, 347·6, 360, and 400 lb., respectively, and the average number of growing days 143, 147, 157, 166, and 172, respectively.

KUBIENA (W.). & RENN (C. E.). **Micropedological studies of the influence of different organic compounds upon the microflora of the soil.**—*Zlb. Bakt.*, Abt. 2, xci, 11–15, pp. 267–292, 3 pl., 2 diags., 1935.

Full details are given of the methods and results of 'micropedological' studies ('direct microtechnical investigations of undisturbed, naturally developed soils') on the influence of the addition of finely divided cellulose, lignin, zein, and gum arabic to a podsol soil at the New Jersey Agricultural Experiment Station. The soil microscope used was designed by W. Kubiena [cf. *R.A.M.*, xii, p. 191] and manufactured by Reichert of Vienna, while the photographs were taken with Czerny's microcamera, supplied by the same firm.

The addition of cellulose stimulated microbic activity within one day, while on the third day mycelial development was most marked in the zein-treated soil. An *Actinomyces* of the *chromogenes* type [ibid., ix, p. 525] predominated in this soil. Soils enriched by each of the four abovementioned elements contained *Gliocladium* sp. and *Verticillium chlamydosporum*, which were also found in those without any added constituent. *Hyalopus* sp. and *Cumminghamella* sp. occurred in soil with zein, and a yellow *Humicola* sp. predominated on the surface of that with cellulose. On the eighth day the soil with gum arabic showed much *Penicillium* infection, which was absent from the other series at this time. *Botrytis cinerea* was detected sporadically in soil with lignin and *G. roseum* and *P. lilacinum* [ibid., xi, p. 325] in that with zein.

Some general considerations arising out of these results are advanced, and the conclusion is reached that the micropedological method forms an indispensable adjunct to the plate and culture technique [ibid., xiii, p. 471], without, however, superseding the latter.

STEENBJERG (F.). **Undersøgelser over Manganindholdet i dansk Jord. II. Det ombyttelige Mangan og dets Afhaengighed af Gødskning og Jordbehandling.** [Investigations on the manganese content of Danish soil. II. The exchangeable manganese and its dependence on fertilizing and soil treatment.]—*Tidsskr. Planteavl*, xl, 3, pp. 337–365, 1 fig., 2 graphs, 1934. [English summary.]

It is already known from the work of the writer and others that grey speck of oats and other agricultural crops in Denmark is due to a deficiency of exchangeable manganese in the soil [*R.A.M.*, xiv, p. 121]. In the present paper details are given of pot experiments in 1933–4 with Victory oats in which various reducing agents were applied in increasing amounts to the soil about a week before sowing with a view to counteracting the trouble, which is stated to be of considerable economic importance in the northern and western parts of Jutland. Other pots received finely powdered manganese dioxide and manganous sulphate for comparison. Quinone, quinhydrone, hydroquinone, sodium sulphite, metol (agfa), formaldehyde, and potato starch gave partial or complete control of the disorder. Waterlogging, which behaves like reducing agents in increasing the amount of exchangeable manganese, had no beneficial effect, and saccharose also failed. The residual effects of manganese dioxide and sodium sulphite in 1934 were inconsiderable and nil, respectively. All the agents giving an increased yield increased the manganese 'value' of the soil and the absorption of manganese by the plant.

The second part of the paper is concerned with the mathematical expression of the quantitative relationship between added and exchangeable water-soluble cations, the close agreement between observed and calculated values being shown by means of experiments with potassium and manganous ions added to given amounts of soil under controlled conditions. An equation which may be used to determine the 'manganese requirement' of the soil is given.

HILDEBRAND (A. A.). **Root rot of Ginseng in Ontario, caused by members of the genus Ramularia.**—*Canad. J. Res.*, xii, 1, pp. 82–114, 3 pl., 2 figs., 1 graph, 1935.

The more destructive of the two diseases of ginseng (*Panax quinquefolium*) roots in Ontario [*R.A.M.*, viii, p. 402] is locally known as the 'disappearing rot' and is characterized by a soft rot which may destroy the roots or reduce them to a peridermal shell enclosing fragments of vascular tissue. It is caused by at least three species of *Ramularia*, *R. panacicola* Zins., *R. mors-panaci* n.sp., and *R. robusta* n.sp. English technical descriptions and Latin diagnoses of the new species are given. In culture *R. mors-panaci* forms an abundant, loose, at first white and later brown aerial mycelium; the septate conidiophores are simple or branched and bear hyaline, ovoid or short-cylindrical to fusiform or long narrow-cylindrical conidia, uni- (mostly) to bicellular, not constricted at the septum, and 4·6 to 50·8 (mostly 5 to 19) by 2·1 to 5·1 μ in diameter. Intercalary, dark-brown chlamydospores, 7·8 to 23·4 μ, are formed in chains or pseudo-sclerotial masses. The aerial mycelium of *R. robusta* is at first white then buff-brown, sparse, or forming a thin seal-brown stroma. The conidia are hyaline, the smaller ones ovoid to broadly

cylindrical, abstricted from simple to sparingly branched conidiophores and often adhering in small, gelatinous heads; the larger, broadly cylindrical, clavate, mostly slightly curved, 0- to 8-septate (55 per cent. 0-septate, 33 per cent. 1-septate, 5 per cent. 2-septate, 5 per cent. 3-septate), and 3·1 to 122 by 1·4 to 9·1 μ (over 92 per cent. not exceeding 65 μ in length). Intercalary, buff-brown chlamydospores, up to 14·5 μ in diameter, are formed in old cultures.

Although the cause of the second disease (locally named 'rust' and marked by superficial, rust-coloured lesions on the roots) has not yet been definitely established, some experimental results, coupled with indirect evidence, would suggest that three of the five forms of *Ramularia* isolated from the lesions (all different from those mentioned above) may bear a causal relation to it.

Cross-inoculation experiments with these forms and also with a number of strains of *Ramularia* from similar lesions on other hosts indicated both variations in pathogenicity and specificity in host relationships. The genus *Ramularia* is evidently an important member of the group of facultative parasites associated with root diseases.

Crop rotation and strict field sanitation are the only measures recommended for the control of the two ginseng root diseases, to which no varieties have been found resistant.

Tims (E. C.). **Severe type of mosaic on a Sugar-cane variety.**—Abs. in *Phytopathology*, xxv, 1, pp. 36–37, 1935.

Of the two mosaic types affecting the C[anal] P[oint] 28–70 sugar-cane variety in Louisiana [*R.A.M.*, xiv, p. 123], one causes much more severe injury than is usually found in mosaic disease, producing a very conspicuous, yellow mottling and decrease in size of the leaves. Yield tests showed that this type reduced tonnage and sucrose content of the juice by 32 and 20 to 30 per cent., respectively. The yellow virus is transmissible to other varieties, which develop mild symptoms resembling those of the ordinary green type.

Cross (W. E.). **Ensayos y observaciones relativos al efecto del mosaico sobre los rendimientos culturales de las variedades P.O.J. 36, 213, y 2725.** [Experiments and observations relative to the effect of mosaic on the cultural yields of the varieties P.O.J. 36, 213, and 2725.]—*Rev. industr. agríc. Tucumán*, xxiv, 3–4, pp. 57–76, 1934. [Received April, 1935.]

The results [which are fully tabulated and discussed] of observations and experiments on the effect of mosaic on the yield of the sugar-cane varieties P.O.J. 36, 213, and 2725 in Tucumán, Argentina, indicated that the two first-named have acquired so high a degree of tolerance to the disease during their twenty years of cultivation in the province that they suffer no loss of productivity [*R.A.M.*, xii, p. 463]. There was practically no difference between the yields of healthy P.O.J. 2725 [see below, p. 397] and the same heavily infested by mosaic.

Desai (S. V.). **The antigenic properties of the Sugar-Cane mosaic virus.**—*Curr. Sci.*, iii, 7, p. xviii, 1935.

In serological tests with anti-sugar-cane mosaic and anti-healthy

juice sera, in which rabbits were immunized by intravenous inoculations with Chamberland candle filtrates of mosaic and healthy leaf juices, the anti-mosaic serum inactivated the mosaic leaf juice while the anti-healthy serum had no effect, this result being confirmed by the fact that all the plants inoculated with the anti-mosaic serum and the mosaic leaf juice mixture remained healthy while those inoculated with the mixture with anti-healthy serum became infected. Precipitation tests with the anti-mosaic serum gave a positive reaction with mosaic leaf juice and a negative one with healthy leaf juice, the anti-healthy serum being faintly positive to both.

DESAI (S. V.). **A new disease of Sugar-Cane.**—*Curr. Sci.*, iii, 7, p. xviii, 1935.

Sugar-canes at Musheri research station, India, developed a disease during the rainy season which is termed 'stinking rot' and is characterized by wilting and a rapid rotting from the top downwards, accompanied by an unpleasant odour. A pathogenic bacterium of the *Bacillus pyocyaneus* group [*R.A.M.*, xiv, p. 16] was isolated from affected material, and found to differ from *Phytomonas* [*Bacterium*] *anthochlorum*, *Bact. aptatum* [ibid., viii, p. 478], and *Bact. marginale*, which represent the allied plant-pathogenic types of this group. It was associated with a saprophytic organism, and combined inoculations with the two were much more effective in causing the disease than cultures of the pathogenic type only. Pathogenicity appeared to be confined to sugar-cane.

MATSUMOTO (T.) & YAMAMOTO (W.). **Three important leaf spot diseases of Sugar Cane in Taiwan (Formosa).**—*J. Soc. trop. Agric. Taiwan*, vi, pp. 584–598, 1 col. pl., 4 figs., 1934. [Received March, 1935.]

A brief report is given of the authors' investigations in the field and laboratory of the three most important leaf diseases of the sugar-cane in Formosa. The first appears not to have been described hitherto, although it has been very prevalent in the eastern part of the island for years. It is characterized by the appearance on the young foliage and on the still unfurled leaves in the spindle of small, narrow, elliptical or longitudinally elongated, yellowish spots with red inclusions, which are visible on both sides of the leaf and are 2 to 10 by 1 to 1·5 mm. in diameter. The lesions gradually expand, turn reddish-brown, and in time involve the whole leaf surface, the original spots at this stage being still distinguishable as somewhat straw-coloured areas. With a lens the spots are seen to be overrun on both surfaces by numerous loosely-branched fungal hyphae, with single (never fasciculate) conidiophores arising at right angles from them. Histological examination showed that the external hyphae emerge from the stomata and may re-enter others at some distance. The internal hyphae may grow intercellularly, but most of them penetrate the cell walls, and occur in the bundle sheath, the parenchyma, and the xylem, though not in the fibres. The external hyphae are hyaline to subhyaline, more or less verrucose, and 1·5 to 2·5 μ in diameter. The conidiophores are pale olivaceous to olivaceous-brown, simple, straight, slightly geniculate, 0- to 6- (mostly 2- or 3-) septate, and 7 to 55 (mostly 16 to 29) by 2·5 to 4 μ. The conidia are

obclavate-filiform, tapering towards the apex, straight or slightly curved, hyaline to subhyaline, 2- to 15- (mostly 5- to 8-) septate, not distinctly constricted at the septa, and measure 29 to 153 (mostly 62 to 91) by 2·5 to 3·7 μ. The fungus is considered to be a hitherto undescribed species of *Cercospora*, for which the name *C. taiwanensis* (with Latin diagnosis) is provisionally suggested until further studies finally determine its taxonomic status. The pathogenicity of the fungus to sugar-cane was proved by inoculations. It is stated by the local cultivators that the P.O.J. 2883 variety is highly susceptible and P.O.J. 2725 highly resistant to the disease. A table gives the results of varietal resistance experiments carried out in 1934. In pure culture the optimum temperature for growth of *C. taiwanensis* was between 25° and 28° C., with a maximum round about 34°.

The other two leaf spots discussed are the yellow spot or 'Rotfleckenkrankheit' due to *C. kopkei* [*R.A.M.*, xiv, pp. 81, 153], and eye spot, the causal organism of which is closely related to *Helminthosporium ocellum* [ibid., xiii, p. 654] in spore characters as well as in symptoms: in a table the Formosan eye spot fungus is compared with the descriptions of *H. ocellum* and *H. sacchari*, and it is concluded that it may be tentatively referred to the former until the identity of this species with *H. sacchari* is definitely settled [ibid., xiii, p. 12].

UNAMUNO (L. M.). **Notas micológicas. IX. Nueva aportación al estudio de los hongos microscópicos de Vizcaya.** [Mycological notes. IX. A new contribution to the study of the microscopic fungi of Biscay.]—*Bol. Soc. esp. Hist. nat.*, xxxiv, 10, pp. 513–528, 4 figs., 1934.

Continuing his geographical and taxonomic studies on the Spanish mycoflora [*R.A.M.*, xiii, pp. 183, 596], the writer gives an annotated list of fifty species (two new to science) collected in 1933 and 1934 in the province of Biscay, of which the following may be mentioned. *Phyllosticta aceris* [ibid., xiii, p. 596] was found on living leaves of *Acer campestre*; *P. paeoniae* on peony foliage (a new species for the country); *P.* (*Phoma*) *tabifica*, considered by Prillieux and Delacroix to be the pycnidial stage of *Sphaerella* [*Mycosphaerella*] *tabifica* [ibid., xiv, p. 282] on beet leaves, another new record for Spain; *Septoria alni* on alder (*Alnus glutinosa*) leaves (new to Spain); *S. passerinii* [ibid., xi, p. 745], characterized by filiform, hyaline, straight or slightly curved, pluriguttulate conidia, sometimes geniculate near one of the tapering extremities, 22 to 40 by 1·5 to 2·3 μ, on leaves of *Lolium italicum* (a new host for this fungus); *Macrosporium* [*Thyrospora*] *sarcinaeforme* [ibid., xiii, pp. 520, 548], a new species for Spain, on red clover (*Trifolium pratense*) foliage; and *Phaeoisariopsis* [*Isariopsis*] *griseola* on bean (*Phaseolus vulgaris*) leaves [ibid., xii, pp. 2, 680].

ROGER (L.). **Quelques champignons exotiques nouveaux ou peu connus. I.** [Some new or little known exotic fungi. I.]—*Bull. Soc. mycol. Fr.*, l, 3–4, pp. 317–332, 9 figs., 1934.

This is a series of notes (including technical descriptions) on seven fungi collected in Africa. *Ragnhildiana manihotis* [*R.A.M.*, xi, p. 130] was found causing leaf spots on cassava (*Manihot utilissima*) on the

Ivory Coast; the amphigenous conidiophores emerge in tufts from the stomata, under which the fungus forms a loose stroma; they are olive-brown or brownish-yellow, simple, 1- to 6-septate, 50 to 200 by 3·5 to 5 μ, and slightly geniculate towards the tip; the conidia are hyaline, cylindrical or slightly clavate, 0- to 3-septate, disposed in chains, and measure 15 to 45 by 4 to 8 μ. Mention may also be made of *Irenina isertiae* [cf. ibid. vii, p. 743] on *Coffea canephora* from the Ivory Coast, *I. coffeae* n.sp. on *C. excelsa* from the French Cameroons, and *Nectria cacaoicola* n.sp. on cacao pods from the Ivory Coast, which is stated to be the perithecial stage of *Fusarium decemcellulare* found in close association with it on the pods. It is pointed out that the similar *Fusarium* found by Reinking and Wollenweber to give in culture the perithecia of *Calonectria rigidiuscula* [ibid., xiii, p. 594] was not on cacao but on another host (*Hibiscus sabdariffa* from Java) and it is considered that the name *F. decemcellulare* Brick should be restricted to the cacao *Fusarium.*

Chardon (C. E.) & Toro (R. A.). **Mycological explorations of Venezuela.** —*Monogr. Univ. Puerto Rico*, Ser. B, Phys. & Biol. Sci., 2, 353 pp., 33 pl. (1 col.), 1 graph, 1 map, 1934.

The present volume, a companion to the 'Mycological explorations of Colombia' (1930) [*R.A.M.*, x, p. 340], is based almost exclusively on material collected in 1930 and 1932, a fairly comprehensive study of which has been made with the assistance of various specialists on different groups of fungi. The survey comprises 667 species, of which 92 are new to science and furnished with Latin diagnoses. Each chapter on the various groups is followed by a bibliography, and indices of hosts and genera of fungi are appended to the volume.

Crossing the Cordillera de la Costa north of Maracay the writers found coffee infected by *Rosellinia* and a phloem necrosis [cf. ibid., xiii, p. 367] resembling the *Rosellinia* disease in its symptomatology. At an altitude above 1,200 m. in the mountains south of Trompillo, more or less heavy infection of coffee by *Stilbella* [*Omphalia*] *flavida* [ibid., xiv, p. 184] was observed. Other coffee parasites encountered were *Cercospora coffeicola* and *Corticium koleroga* [ibid., xiv, p. 164]. On the cacao plantations of Ocumare de la Costa nearly every tree was infected by *Irenopsis guianensis*, while much damage to the sprouts was caused by *Phytophthora* [? *palmivora*: ibid., xiv, p. 87].

Almost all the sugar-cane fields in Caracas were infected by the necrotic stage of mosaic [ibid., xiv, p. 123] and by *Leptosphaeria sacchari* [ibid., xiv, p. 57]. Mosaic was also prevalent in several districts on the older varieties and the newly imported B.H. 10 (12); P.O.J. 2725 and 2878, however, were flourishing. Dry top rot (*Plasmodiophora* [*Ligniera*] *vascularum*) [ibid., xii, p. 466] was widespread in a field of Cristalina cane, this being the first record of the disease in South America.

Bananas in the Manuare Valley, where they are interplanted with coffee, were found to be heavily infected by Panama disease (*Fusarium* [*oxysporum*] *cubense*), locally believed to be due to the influence of Halley's comet.

Anthracnose [*Gloeosporium ampelophagum*: ibid., viii, p. 636] is a limiting factor in viticulture during the wet season (June to November)

at Valencia. *Plasmopara viticola* attacked only a small proportion of the fruits.

'Mal di gomma' was observed on grapefruit and mandarins at Valencia [cf. ibid., iii, p. 523], and *Septobasidium alni* occurred on the twigs and leaves. Sour oranges in San Felipe suffered severe damage from scab [*Sporotrichum citri*].

KOCHMAN (J.). **Przyczynek do znajomości flory głowni Polskich.** [Contribution to the knowledge of the Polish Ustilaginales.]—*Acta Soc. Bot. Polon.*, xi, Suppl., pp. 285–303, 3 pl., 5 graphs, 1934. [English summary.]

In this paper the author gives brief descriptions of, and notes on, some smuts which have been recently collected by him in Poland and which are apparently new records for that country, including *Entyloma cichorii* Wróblewski which was found on two chicory (*Cichorium intybus*) plants, on the leaves of which it formed scabby, vivid green (later brownish) spots, 0·5 to 2 mm. in diameter, frequently surrounded by a yellowish halo. The spores are greenish in mass, globose, broadly-elliptical or polygonal, frequently elongated at one or both ends and measure 9 to 15 by 12·5 μ.

LEONIAN (L. H.). **Identification of Phytophthora species.**—*Bull. W. Va agric. Exp. Sta.* 262, 36 pp., 1 pl., 5 figs., 1 diag., 1934. [Received March, 1935.]

After pointing out the difficulties inherent in the classification of the genus *Phytophthora*, and a brief discussion of the attempts previously made in this respect [cf. *R.A.M.*, x, p. 754], the author gives a summarized account of his cultural study of all the available species and varieties (representing a total of 100 pure cultures obtained from various sources) of the genus, with the exception of *P. infestans*, *P. thalictri*, and *P. phaseoli*, the differential characters (host relationships) of which have already been sufficiently established, and certain other incompletely described or unobtainable species which are probably of little taxonomic significance. In preliminary experiments it was found that a number of the cultures dissociated freely, this being particularly true of *P. parasitica* var. *rhei*, some ninety dissociants of which were included in the studies.

The variability tests were based on the behaviour of the cultures at five different temperatures (variations of which in the incubators used did not exceed two-tenths of one degree C.), and in five different concentrations of malachite green [ibid., ix, p. 809], one concentration of tartaric acid [ibid., ix, p. 206], and one of potassium carbonate. The ability of a given organism to produce sporangia, oogonia, and chlamydospores, either together or in different associations, was found to be a valuable taxonomic criterion, as was also the ability to produce sporangia when sterile mycelium is transferred from pea broth into distilled water. By combining the results of his experiments [which are shown in tables] with dependable data obtained by previous workers, the author compiles a key permitting of the identification of twenty-two species and varieties which are retained, not because they are believed to have a sound specific basis, but because they possess one or more constant characteristics by which they can be singled out from the rest

by using the key. The latter is based mainly on cultural characters, oospore dimensions being sparingly used. A number of former species have been merged together (e.g., *P. arecae*, *P. jatropha*, *P. meadii*, *P. melongena*, *P. parasitica*, *P. tabaci*, and certain others are all referred to *P. palmivora*) [cf. ibid., x, p. 754], and a few have been re-established in the preparation of the key. The author believes, however, that further studies will show that there are not more than three good species of *Phytophthora*, namely, *P. infestans*, *P. cactorum*, and *P. palmivora*.

GOTO (K.). **Sclerotium rolfsii Sacc. in perfect stage. II. Studies on Sclerotium rolfsii of foreign origin in comparison with some strains of Formosa.**—*J. Soc. trop. Agric. Taiwan*, v, pp. 374–382, 2 figs., 1933. [Received March, 1935.]

Further studies on thirty strains of *Sclerotium rolfsii* from foreign countries and Japanese localities other than Formosa, in comparison with seven from the latter island and with *S. delphinii* [*R.A.M.*, xiii, p. 273; xiv, p. 147] showed that many of the foreign strains fell into the previously described groups I and II, which may produce basidiospores, while the foreign strains belonging to group IV were infertile. Group IV (ii), comprising some of the Indian strains [ibid., xiv, p. 125] and three from Malaya, differs somewhat from the type of group IV mentioned in the earlier study, being closer in some respects to R 25 from Formosa. With one exception (which resembled *S. delphinii* and is included with the latter in a fifth group) all the thirteen American strains sent as *S. rolfsii* fell into groups I and II and produced *Corticium*-like hymenia, as also did one of the four Indian and both the two African strains. These strains, which appear to be referable to *S. rolfsii* proper, are evidently widespread all over the world, more especially in the tropical and warm-temperate regions, including Japan, China, the Philippines [ibid., xiv, p. 315], Malaya, India, Africa, southern Europe, and the southern United States.

PIRONE (P. P.). **An improved method for inducing spore fructification in certain species of Macrosporium.**—Abs. in *Phytopathology*, xxv, 1, pp. 31–32, 1935.

Profuse conidial formation by *Macrosporium carotae*, the agent of carrot leaf blight [*R.A.M.*, xii, p. 356, 496], was induced by air-drying plate cultures for 24 to 48 hours at 21° C. with a relative humidity of 30 to 40 per cent. The age of the cultures used ranged from 5 days to 4 weeks, and the media employed were carrot, maize meal, and potato-dextrose agars. Undried cultures of identical origin and age produced few or no conidia. A cellophane covering placed a few inches above the exposed plates obviated the risk of contamination during exposure, and the spores appeared 48 hours after the Petri dishes were recovered.

KUNKEL (L. O.). **Recent advances in studies on plant virus diseases.**—*Rep. Quebec Soc. Prot. Pl. 1932–1934*, pp. 23–33, 4 figs., 1934.

In this paper (read before the Quebec Society for the Protection of Plants) the author reviews and discusses recent work on plant virus

diseases with special reference to three of its aspects, viz., quantitative studies on the tobacco mosaic virus [*R.A.M.*, xii, p. 526; xiv, p. 198], the isolation of variant strains of this virus [ibid., xiii, p. 330; xiv, p. 61], and the insect transmission of virus diseases in general.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, vii, 1, pp. 4–5, 9–12, 1935.

GERMANY (BREMEN). An Order of 20th November, 1934 (Fourth Potato Wart Control Order), enacts that in 1935, holdings of 1,000 sq. m. or under are to be planted exclusively with wart [*Synchytrium endobioticum*]-immune potato varieties authorized by the German Plant Protection Service. In exceptional circumstances a permit may be obtained from the local authorities (by professional potato-growers only) for the cultivation of the susceptible Erstling [Duke of York] variety [cf. *R.A.M.*, vi, p. 320].

GREAT BRITAIN AND NORTHERN IRELAND. The regulations relating to the importation of plants into Great Britain and Northern Ireland are summarized.

Legislative and administrative measures. Canada.—*Int. Bull. Pl. Prot.*, ix, 1, p. 16, 1935.

According to an announcement of the Canada Destructive Insect and Pest Act Advisory Board, dated 17th October, 1934, mushroom [*Psalliota campestris* and *P. arvensis*] spawn is to be exempt from the requirements of Regulation No. 1 (Foreign) of the Destructive Insect and Pest Act [cf. *R.A.M.*, iii, p. 239], so that the regulations governing importation permits, health certificates, and inspection on arrival no longer apply to this commodity.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements July–September 1934. Quarantine and other official announcements.—pp. 71–72, 79, 80–89, 1935.

On and after 1st October, 1934, the use of willow (*Salix*) withes in the packing of nursery stock destined for the United States from Europe and Canada (which imposes no restrictions on the entry of such material from Europe) is prohibited with a view to the exclusion of the watermark disease (*Bacterium salicis* and *Pseudomonas saliciperda*) [*R.A.M.*, xiii, p. 334].

A resolution taking effect on 15th September, 1934, prescribes, as a condition of entry into Cuba, the disinfection, by immersion for at least five minutes in a 1 in 3,000 solution of bichloride of mercury, of all tomato and pepper (*Capsicum* spp.) seeds to prevent the introduction of *Bact. vesicatorium* [ibid., xii, p. 555, and above, p. 344].

A summary is given of the plant quarantine import restrictions operative in Czecho-Slovakia.

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THORNBERRY (H. H.). **Particle size of three strains of Tobacco-mosaic virus.**—Abs. in *Phytopathology*, xxv, 1, p. 36, 1935.

The particle size of the related tobacco, aucuba, and masked tobacco mosaic viruses was determined by ultrafiltration through Elford's type of collodion membranes [*R.A.M.*, xii, p. 646]. In finding the end point of ultrafiltration (the smallest pores admitting passage of the virus), the amount of virus in the filtrates was measured by the local lesion method [ibid., xiv, p. 198] on Scotia beans [*Phaseolus vulgaris*]. Under favourable conditions for filtration (0·1 M. Sörensen's phosphate buffer at P_H 8·5 and 10 per cent. broth), membranes with pores 0·0905 μ in diameter allowed the passage of a small quantity of each virus. Membranes with pores 0·0329 μ in diameter retained the viruses. Elford assumes that virus particles exceeding one-third of the pore diameter do not pass the membranes, and on this basis the virus particles were found to measure not more than 0·03 μ or 30 $\mu\mu$.

VALLEAU (W. D.). **The resistance of Ambalema Tobacco to different viruses.**—Abs. in *Phytopathology*, xxv, 1, p. 37, 1935.

Nicotiana tabacum var. Ambalema, found by Nolla to be highly resistant to ordinary tobacco mosaic, is susceptible to cucumber mosaic, green and yellow ring spot, and slightly resistant to the etch viruses [*R.A.M.*, xii, p. 205]. Most of the twenty-seven strains of tobacco mosaic inoculated into Ambalema plants caused only very mild symptoms, but four produced chlorotic (in one virus necrotic) Liesegang patterns, often covering the leaf and evidently resulting from slow penetration of healthy tissues. Ambalema appears to separate strains from a given supposedly stable tobacco mosaic virus by a process analogous to that involved in the production of so-called attenuated strains by heat. A strain of white tobacco mosaic from Kentucky and the English aucuba mosaic each produced necrotic spots and concentric necrotic ring patterns on inoculated Ambalema leaves, the virus apparently being localized.

DUGGAR (B. M.) & MCALISTER (D. F.). **Some factors affecting 'longevity' in vitro of viruses of Tobacco mosaic and of Tobacco ring spot.**—Abs. in *Phytopathology*, xxv, 1, p. 15, 1935.

The length of survival of the typical tobacco mosaic virus in tobacco extract is prolonged by condensation of the extract at low pressure and

temperature, and further by the addition of low concentrations of ethyl alcohol. The active period of the tobacco ring spot virus (Wingard strain) may also be prolonged, within limits, by a low concentration of alcohol and by the addition of certain buffers, preferably phosphate, at definite P_H values, especially between P_H 5·8 and 7. The phosphate buffer also increases the dispersion of the ring spot virus as gauged by the incidence of primary infection lesions.

VALLEAU (W. D.). **Do Tobacco plants recover and develop an immunity from ring spot?**—Abs. in *Phytopathology*, xxv, 1, p. 37, 1935.

The apparent recovery and immunity of tobacco plants from ring spot [see preceding abstracts] may be explained as follows. Plants inoculated with the virus develop ring patterns on the leaves until invasion of the growing point is complete. The foliage developing after complete invasion is devoid of patterns, but is nevertheless highly viruliferous. The inoculation of such leaves is without effect, the cells being already parasitized to the limit. An acquired immunity [*R.A.M.*, xii, p. 120] is not involved. Similarly, tobacco plants inoculated with a mild strain of tobacco mosaic are protected against a more virulent strain of the same virus [cf. ibid., xiv, pp. 330, 388].

MATSUMOTO (T.) & SOMAZAWA (K.). **Immunological studies of mosaic diseases. IV. Effects of acetone, lead subacetate, barium hydroxide, aluminium hydroxide, trypsin and soils on the antigenic property of Tobacco mosaic juice.**—*J. Soc. trop. Agric. Taiwan*, vi, pp. 671–682, 1934.

A detailed, tabulated account is given of the writers' further studies on the antigenic properties of tobacco mosaic juice [*R.A.M.*, xii, p. 598], involving in the first place serological tests on the partially purified virus [cf. ibid., xiii, p. 545], which was freed from accretions by the addition of appropriate amounts of acetone, lead acetate, and barium or aluminium hydroxide. The results of these experiments showed that antigenic properties of mosaic juice persisted for the duration of infectivity. Mary Lojkin and Vinson have shown [ibid., xi, p. 334] that trypsin can inactivate the infectivity of the virus [cf. ibid., xiv, p. 199] only when the latter is treated with acetone previously to contact with the enzyme. The antigenic property, however, remains unimpaired in both the acetone-treated and control juices. Passage through soil, especially in the case of sterilized or dry material, greatly reduced the antigenic capacity and infectivity of the virus.

From a consideration of these results it may be inferred that the above-mentioned serological reactions are due, not to modifications in the plant proteins and the like, but to the antigenic property of the virus *per se*. Some evidence, not yet entirely conclusive, was obtained in support of the view that the virus is absorbed by the roots of plants grown in nutrient solutions without necessarily producing any external symptoms except under favourable conditions.

ROSS (A. F.). **The effect of proteoclastic enzymes on purified preparations of Tobacco mosaic virus.**—Abs. in *Phytopathology*, xxv, 1, p. 33, 1935.

The tobacco mosaic virus was inactivated by trypsin [see preceding

abstract], but most of the virus was recovered on heating the digests to 70° C. for 20 minutes. Permanent inactivation of the virus did not follow the use of enterokinase, calcium sulphate, calcium chloride, ammonium sulphate, magnesium sulphate, and barium chloride as activators for trypsin. A combination of trypsin and pepsin [*R.A.M.*, xiv, p. 260] had less inactivating effect than the former alone. The virus was inactivated by papain and (slowly) by mixed cultures of *B[acillus] proteus* and *B. aerogenes*. Trypsin did not appear to attack any protein that may be associated with the virus.

CLAYTON (E. E.). **A new and important factor in the epidemiology of Tobacco leaf diseases.**—Abs. in *Phytopathology*, xxv, 1, p. 11, 1935.

Recent observations indicate that the well-known promotion of tobacco wildfire (*B[acterium] tabacum*) epidemics by storms is largely a result of a breakdown in the resistance of the host, the intercellular leaf spaces of which, flooded by the driving rains, develop well-defined water-soaked areas, through which the bacteria rapidly spread, forming within 48 hours necrotic lesions of considerable extent. Similarly, *B[act.] angulatum* rarely forms spots exceeding $\frac{1}{8}$ in. in diameter on the normal leaf, whereas in water-soaked tissues the large lesions typical of field black fire readily develop. Low topping and low potash or high nitrogen manuring increase the liability of the foliage to water-soaking and hence to these diseases, the reverse effects following high topping and high potash or low nitrogen fertilizing.

HENDERSON (R. G.). **Control of downy mildew of Tobacco.**—Abs. in *Phytopathology*, xxv, 1, p. 19, 1935.

Effective control of tobacco downy mildew [*Peronospora* sp.: *R.A.M.*, xiii, p. 604] was given in greenhouse tests by benzoic acid, cuprous oxide [ibid., xiv, p. 382], and copper-molasses mixture sprays. Good results were also obtained in these and previous trials with calcium sulphide [ibid., xiii, p. 402], applied at three-day intervals; the stunting that characterized the treated greenhouse plants was not apparent in the open.

BORDELEAU (R.). **The black rot of Tobacco in the Province of Quebec.**—*Rep. Quebec Soc. Prot. Pl. 1932–1934*, pp. 135–139, 1934.

After stating that in both of the large tobacco-growing areas in Quebec black root rot (*Thielavia* [*Thielaviopsis*] *basicola*) [*R.A.M.*, xiii, pp. 13, 276] is very prevalent, causing up to 75 per cent. losses, especially in poorly drained or alkaline soils, the author gives brief recommendations for preventive treatment by seed-bed disinfection either with steam or by applications of 1 in 50 formalin (40 per cent. formaldehyde) made at the rate of half a gallon per sq. ft., and improved cultural methods. As the soil locally tends to be acid and soil acidity is known to be unfavourable to the disease [ibid., xii, p. 493], care must be taken in the use of lime.

In varietal resistance tests the pipe varieties S. S. Burley, Waine, Greenwood, and Belge proved very susceptible. Infection reduced the yield of the most suceptible cigar varieties, such as Brown's Havana and Connecticut Havana 38, by 50 per cent., though with the more

resistant varieties of this type the quality was more adversely affected than the yield. With the susceptible varieties the quality was reduced by at least one-third. Fifty-seven per cent. of the roots of Resistant Havana and 40 per cent. of those of Connecticut Havana 142 C3 X were unaffected, and no root of either of these two varieties was severely attacked. With susceptible cigar varieties 10 to 35 per cent. of the plants were severely infected, at least half the roots showing moderate attack.

Böning (K.). **Beiträge zur physiologischen Pathologie des Tabaks.** [Contributions to the physiological pathology of Tobacco.]—*Prakt. Bl. Pflanzenb.*, xii, 10, pp. 303–311, 3 figs., 1935.

Tobacco in acid soils in the district between Nuremberg and Erlangen, Germany, is stated to be liable to chlorosis, thickening, and spotting of the foliage which was found to be due to the presence in the soil of insoluble manganese salts [*R.A.M.*, xi, p. 548] in the proportion of 80 to 270 mg. per kg. The condition, which also affected barley, wheat, beets, cabbage, and swedes, as well as various weeds, was ameliorated by the application to the soil in appropriate amounts of the carbonates of lime, magnesium, or sodium, or of calcium sulphate or chloride. The beneficial effect of the treatment was apparently due, not only to the adjustment of the soil reaction but also to the counteraction by the calcium ion, either of the absorption of the manganese ion or of the injurious influence of the latter after absorption.

Shapovalov (M.). **Chemical splitting of the Tomato 'combination-streak' virus complex.**—Abs. in *Phytopathology*, xxv, 1, p. 33, 1935.

Of the two virus components of the 'combination-streak' of tomato [*R.A.M.*, xiv, p. 201], green tobacco mosaic (Johnson's virus No. 1) generally showed a higher resistance to chemicals than the latent (healthy) potato virus. Certain sulphates, viz., cobaltic, nickel and zinc, at concentrations incapable of destroying the entire complex sometimes inactivated one or other of the two components in the expressed juice completely, leaving the second to survive alone.

Gardner (M. W.), Tomkins (C. M.), & Whipple (O. C.). **Spotted wilt of truck crops and ornamental plants.**—Abs. in *Phytopathology*, xxv, 1, p. 17, 1935.

Additional hosts of the tomato spotted wilt virus in California [*R.A.M.*, xiv, p. 201] have been experimentally shown to include cauliflower, celery, *Nicotiana glauca*, and species of *Amaryllis*, *Begonia*, *Browallia*, *Campanula*, *Cheiranthus*, *Delphinium*, *Gloxinia*, *Godetia*, *Gaillardia*, *Layia*, *Papaver* [cf. ibid., xiv, p. 129], *Pentstemon*, *Primula*, *Salvia*, and *Verbena*. The virus has been transmitted by *Thrips tabaci* from *Emilia* to *Emilia* and tomato, and by *Frankliniella* spp. from *Datura* to poppy and from tomato to tobacco. It has been found to survive 73 hours' storage at 0°. Spotted wilt appears to be favoured by fairly low temperatures and a moist climate.

Boyd (O. C.). **Evidence of the seed-borne nature of late blight (Phytophthora infestans) of Tomatoes.**—Abs. in *Phytopathology*, xxv, 1, p. 7, 1935.

Until the outbreaks of 1932 and 1933, late blight (*Phytophthora*

infestans) had caused no damage to tomatoes in Massachusetts since 1905 [*R.A.M.*, xii, p. 249; see also xiii, p. 52]. An experiment at Amherst in 1934 showed that the fungus overwintered in tomato seed saved in 1933 and so initiated infection in the next season's crop, and seed from affected plants in that and the following year contained mycelium outside and within the seed coats which gave pure cultures of *P. infestans* on agar. The 1932 and 1933 late blight epidemics may possibly be due in part to the favourable conditions for the survival of the fungus in the seed provided by the two preceding exceptionally mild winters.

Baldacci (E.) & Ciferri (R.). **Intorno alla patogenicità di alcuni batterii dell'uomo per il frutto del Pomodoro.** [Concerning the pathogenicity of some human bacteria to Tomato fruit.]—*Boll. Soc. ital. Biol. sper.*, ix, 3, pp. 197–200, 1934.

Only two out of the twenty-three bacterial pathogens of man inoculated under controlled conditions into the fruit of San Marzano tomatoes gave positive results in the form of an ordinary rot indistinguishable from that induced by various plant pathogens [cf. *R.A.M.*, vi, p. 263]; these were *Proteus vulgaris* and [*Bacillus*] *pyocyaneus* [ibid., xiv, p. 16]. Similar results were obtained with two non-pathogenic, chromogenic (orange and pink) cocci, but in no case did the organisms cause the typical symptoms of 'apical rot' a disease which, though commonly attributed to *Bacterium briosii* [ibid., vii, pp. 9, 491], the authors consider to be of physiological origin.

Ciferri (R.) & Baldacci (E.). **Intorno alla patogenicità di alcuni miceti dell'uomo per il frutto del Pomodoro.** [Concerning the pathogenicity of some human fungi to Tomato fruit.]—*Boll. Soc. ital. Biol. sper.*, ix, 3, pp. 200–202, 1934.

Of 22 human pathogenic fungi and 1 insectivorous fungus inoculated under controlled conditions into tomato fruits [cf. preceding abstract], 18 gave positive results, viz., *Coccidioides immitis* [*R.A.M.*, xiv, p. 234], *Lichtheimia italica* [ibid., vii, p. 720], *Mucor racemosus* [ibid., xiv, p. 236], *Debaryomyces fabryi* Ota, *Hansenula anomala* (Hans.) Syd., *Geotrichum candidum* Link [ibid., ix, p. 201] var. *parasiticum* Pr. et P., *Fusarium moronei* Curzi [ibid., x, p. 540], *Torula sacchari* [ibid., xiii, p. 701], *Acrostalagmus cinnabarinus* [ibid., xiv, p. 237], *Beauveria bassiana* [ibid., xiv, p. 361], *Cephalosporium acremonium* [ibid., xiii, p. 572], *C. gruetzii* [cf. ibid., viii, p. 783], *C. cerebriforme*, *Microsporon audouini* [ibid., xiii, p. 768; xiv, p. 102], *Penicillium brevicaule* [*Scopulariopsis brevicaulis*: ibid., xiv, p. 104], *Sporotrichum councilmani* [ibid., xi, p. 647], *S. gougeroti* [ibid., xii, p. 579], *Trichophyton roseum* [ibid., xii, p. 173], and *Trichosporum aschii* Ota.

These results are considered not only to confirm those obtained by Rhoda Benham and Beatrice Keston with various species of *Sporotrichum* in the United States [ibid., xi, p. 646], but also to amplify their conclusions as regards the adaptability of human pathogens to plant hosts.

MAY (C.). **Notes on the work of the Dutch Elm disease laboratory.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf., 1934*, pp. 73–75, 1 graph, [? 1934.]

Between 26th June, 1934, when the Dutch elm disease [*Ceratostomella ulmi*: *R.A.M.*, xiv, p. 338] research laboratory of the Division of Forest Pathology, Bureau of Plant Industry, was opened at Morristown, New Jersey, and the following 18th August, 8,763 specimens of diseased elm material, mostly from New Jersey, New York, and Connecticut, were received and cultured. Among the disorders liable to confusion with the Dutch elm disease are the wilts due to *Verticillium* [*albo-atrum*: ibid., xii, p. 125] and a *Cephalosporium* [ibid., xiii, p. 478], the pycnidial stage of which is stated to have been recently detected. The graph showing the incidence of the different diseases indicates that the *Cephalosporium* wilt appears somewhat earlier in the season than Dutch elm disease, the maximum incidence of which (just over 80 per cent.) was recorded during the period from 11th to 20th June and again, with only a negligible drop, from 1st to 10th July.

BEATTIE (R. K.). **Advances in our knowledge of the Dutch Elm disease.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf., 1934*, pp. 76–78, [?1934.]

Most of the information in this brief account of recent progress in the knowledge of the Dutch elm disease [*Ceratostomella ulmi*: see preceding abstract] has already been noticed from other sources, but the following points are of interest. Burl elm logs, imported into the United States for the cutting of fancy veneer, have been intercepted and found to harbour the fungus at New York, Baltimore, Norfolk, and New Orleans; at Baltimore an infected tree was observed within a quarter of a mile of the unloading pier. On the defoliation of elm trees about mid-October, external symptoms of infection disappear, but a method of twig sampling was evolved during the winter of 1933–4 to facilitate the detection of diseased individuals in regions known to be invaded by *C. ulmi*. Coremia of the *Graphium* stage of the fungus, hitherto obtained only in laboratory cultures, have been found in the bark of a standing tree dead for about a year. Special attention is being given to the work of propaganda in camps of the Civilian Conservation Corps.

The paper was followed by a discussion (pp. 78–95), in which the author was represented by C. May.

KÖCK (G.). **Eichenmehltau und Rauchgasschäden.** [Oak mildew and smoke gas injuries.]—*Z. PflKrankh.*, xlv, 1, pp. 44–45, 1935.

During his eight years' activity as a smoke injury expert in Upper Styria, Austria, the writer was impressed by the complete absence of the otherwise widespread oak mildew (*Microsphaera alni* var. *quercina*) [*M. quercina*: *R.A.M.*, xiv, p. 190] from the vicinity of factories. Evidently the sulphurous acid-containing gases emanating from paper works and the like exert a fungicidal action on the mildew similar to that of the sulphur dusts commonly used for its control.

ASHCROFT (J. M.). **European canker of Black Walnut and other trees.**—*Bull. W. Va. agric. Exp. Sta.* 261, 52 pp., 7 pl., 1934. [Received March, 1935.]

This is a detailed, tabulated account of the author's studies of the canker on black walnut (*Juglans nigra*) in West Virginia associated with *Nectria* [*R.A.M.*, ix, p. 751]. Two main types of the younger stages of the disease are distinguished, namely, one usually developing around a stub of a lateral branch, in which the bark at first remains adherent to the wood and is only later sloughed off from the centre, and the other, apparently not associated with a dead stump, first appearing as a tumour-like swelling on the trunk which, after reaching a considerable size, bursts open and exposes the underlying wood. Both types develop in the same way in their later stages. Similar cankers were also found in West Virginia on *Liriodendron tulipifera*, *Acer rubrum*, *Quercus rubra*, *Q. velutina*, *Q. alba*, *Hicoria glabra*, and *Juglans cinerea*. The black walnut cankers have been found in eight other States to the north-east and in Ontario, Canada.

The histological examination of one-year-old cankers resulting from inoculations into young black walnut trees indicated that the fungus kills the invaded tissues in advance of its growth, as the mycelium has never been observed inside of, or contiguous to living cells. At first growth in the bark tissues appears to be mostly, if not entirely, intercellular; staining tests suggested that the hyphae advance between the cells by dissolving the pectic compounds of the middle lamella and cell wall; the invasion progresses very much more rapidly in the phloem than in the cortex. The wood is apparently reached through the medullary rays, and is much less actively destroyed than the bark, the mycelium remaining entirely intracellular in the xylem. Micro-chemical tests showed that the fungus does not attack either lignin or cellulose. Soon after the resumption of cambial activity in the spring, the host reacts by the formation of phellogen extending from the cambium outward; the cambial activity is most vigorous at the margins of infection, the amount of tissue produced in these regions far exceeding that on the opposite side of the stem. The cells first produced at the edge of the canker do not develop into normal xylem but remain undifferentiated, and go to form a mass of tissue which bulges out in the direction of the wound. Inoculation experiments indicated that the fungus enters the host tissues only through wounds reaching down to the cambium, and fully developed cankers were produced on black walnut in this manner.

In a full discussion of the taxonomy of the species of *Nectria* which cause cankers on deciduous trees [which are listed in two tables] and of closely related species, the author shows that the size of the spores is of no systematic value; he describes, however, certain morphological characters, on the basis of which he separated the species studied by him into three groups, the first of which includes all the specimens associated with cankers of the hosts mentioned in the first paragraph, together with the type specimen of *N. galligena*. Cross-inoculations showed that the forms from each of these hosts can infect the black walnut, while that from the latter can infect black and white oak, white walnut (*J. cinerea*), and four species of *Hicoria*. It is concluded that all

the cankers studied are caused by the 'European canker' fungus, *N. galligena*.

HAMOND (JOYCE B.). **A graft disease of Walnuts caused by a species of Chalaropsis.**—*Trans. Brit. mycol. Soc.*, xix, 2, pp. 158–159, 1935.

In this brief note the author states that the strain of *Chalaropsis thielavioides* isolated from diseased walnut grafts at the East Malling Research Station [*R.A.M.*, xi, p. 80] was compared with three strains of the fungus from a walnut root, carrots [ibid., xi, p. 423], and peach seedlings, respectively. While all the four strains bore a general morphological resemblance, that from carrots differed in its almost spherical macrospores of an olive-green colour in mass. In their cultural relations they tended to form a series from the walnut graft to the carrot strain, and their response to temperature suggested an adaptation of the fungus to the environment of its host. Naturally infected walnut roots showed varying degrees of disintegration of the tissue, beginning at the surface of wounds, and histological studies indicated that *C. thielavioides* always enters young walnut trees through a wound or at a cut surface, not through the uninjured bark. When inoculated into walnuts at the time of grafting, the four strains differed strikingly in degrees of parasitism, though none did much damage when inoculated into shoots of established trees.

Laboratory tests showed that the macrospores of the fungus are very easily killed by formalin, and this is now generally used at East Malling to control the walnut graft disease. Macrospores similar to those observed on walnut grafts have been identified on some walnut shells in the Kew Herbarium.

CHARLES (VERA K.). **A little known Pecan fungus.**—*Mycologia*, xxvii, pp. 74–82, 2 figs., 1935.

The writer describes and discusses the morphological characters of a fungus of somewhat obscure affinity appearing in the form of snow-white tufts on the lower surface of living pecan (*Hicoria* [*Carya*] *illinoensis*) leaves in Texas, in relation chiefly to its taxonomic position. From a study of the available exsiccata and the relevant literature it is concluded that the organism is a new variety (var. *minor*) of *Articularia quercina* (Peck) von Höhnel, the host of which is oak. It is characterized by 12- to 16-jointed conidiophores closely united into an erect bundle, 0·5 mm. in height, each conidiophore bearing eight oblong to fusoid, slightly curved, hyaline conidia, 6 to 8 by 2·5 to 3 μ in diameter.

Articulariella aurantiaca (Ell. & Mart.) v. Höh. is considered in the light of these investigations to be synonymous with *Fusisporium album* Desm., *Helostroma album* (Desm.) Pat., and *Microstroma album* (Desm.) Sacc. [*R.A.M.*, xi, p. 745].

JACKSON (L. W. R.) & SLEETH (B.). **A new disease affecting Platanus orientalis in the eastern United States.**—Abs. in *Phytopathology*, xxv, 1, p. 22, 1935.

A destructive disease associated with an *Endoconidiophora* form of *Ceratostomella* [cf. *R.A.M.*, xiv, pp. 270, 274] is stated to be destroying oriental planes (*Platanus orientalis*) at an alarming rate in Delaware

County, Pennsylvania. The foliage of affected trees becomes progressively sparser and suddenly wilts, while the bark on the main trunk shows numerous longitudinal lesions corresponding to black wood discolorations sometimes extending inwards to the pith. Positive results resembling the spontaneous infections followed inoculation of 14 two-year-old plane cuttings with pure cultures of the fungus (which emits a strong banana-oil odour), the incubation period ranging from 4 to 13 weeks. Bark lesions ½ in. long were produced in 11 days by inoculation on uninjured sites.

HARTLEY (C.) & CRANDALL (B. S.). **Vascular disease in Poplar and Willow.**—Abs. in *Phytopathology*, xxv, 1, pp. 18–19, 1935.

The wood of Lombardy poplars (*Populus nigra*) in the District of Columbia is stated commonly to show water-soaked, later red, and ultimately brown stains, from the marginal region of which short, rod-shaped bacteria, forming quantities of gas, are readily isolated. Death does not ensue until the infection has spread almost throughout the cross section of the trunk. A similar disorder has been observed in cottonwood (*P. deltoides*), goat willow (*Salix capraea*), and other as yet unidentified willows. In both poplar and willow the symptoms are somewhat suggestive of the 'watermark' disease of the latter host in Europe [*Pseudomonas saliciperda*: *R.A.M.*, xiii, p. 334]. Reddish discolorations containing bacteria also occur in many young plane trees (*Platanus* sp.) in a nursery near Washington.

POMERLEAU (R.). **The fungi responsible for seedling blight of Conifers at the Berthierville forest nursery.**—*Rep. Quebec Soc. Prot. Pl., 1932–1934*, pp. 58–61, 1934.

Observations on the fungi responsible for the considerable annual mortality due to blight among conifer seedlings at the forest nursery, Berthierville, Quebec, showed that out of 165 cultures from affected material 22 yielded *Alternaria* sp., 16 were *Fusarium solani*, 8 *F. ferruginosum*, 7 *F. redolens* var. *solani* and 7 *F. subpallidum*, some 12 other species of this genus being occasionally found; *Rhizoctonia* was sometimes isolated, but *Pythium de Baryanum* was not encountered. The most virulent of the organisms appeared to be *Rhizoctonia* sp., which was chiefly responsible for the rotting of the rootlets.

JACKSON (L. W. R.) & CRANDALL (B. S.). **A Phytophthora root and collar rot of Pinus resinosa seedlings.**—Abs. in *Phytopathology*, xxv, 1, p. 22, 1935.

Severe damage has been inflicted of recent years on *Pinus resinosa* seedling and transplant stock in an eastern United States forest nursery by a species of *Phytophthora* closely resembling *P. cinnamomi* [*R.A.M.*, xiv, pp. 147, 264], inoculations with which on potted red pine plants were followed by the typical dry bark rot involving the whole root system and sometimes extending several inches up the stem. Conspicuous features of the disease are the dark coloration of the wood and the copious resin exudation associated with vascular infection, while large pith pockets are also commonly formed in the wood. The other fungi found in the root and collar lesions on red pine, viz., species of *Pestalozzia*,

Sphaeropsis, *Sclerotium*, and *Rhizoctonia*, produced resiniferous areas and sometimes death, but not the characteristic symptoms of the *Phytophthora* disease.

KIMMEY (J. W.). **Susceptibility of principal Ribes of southern Oregon to White-Pine blister rust.**—*J. For.*, xxxiii, 1, pp. 52–56, 1935.

The rapid spread of white pine [*Pinus monticola*] blister rust (*Cronartium ribicola*) in northern and central Oregon necessitated a study of the reaction to the fungus of the important species of *Ribes* [cf. *R.A.M.*, xii, p. 407; xiv, p. 66] found in the valuable sugar pine (*Pinus lambertiana*) stands of the southern part of the State with a view to the planning of control measures. To this end a total of over 300 plants of *G*[*rossularia*] [*Ribes*] *klamathensis*, *R. marshallii*, *R. sanguineum*, *R. hallii*, *R. binominatum*, *R. erythrocarpum*, *R. velutinum*, and *R. cruentum* were set in 1930 in an experimental garden in the Mt. Hood National Forest where severe infection had already been observed on *P. monticola*. In 1931 and 1933 the plants were exposed to natural infection from the neighbouring diseased trees, and in 1932 they were heavily inoculated with aecidiospores from western white pine cankers.

All the species were found to be highly susceptible to infection with the exception of *R. hallii*, and all (including the latter) produced a large or moderate number of teleutosori on the diseased leaves. Any effective control programme would thus involve the eradication of all the alternate hosts used in these trials.

HUNTER (LILLIAN M.). **A preliminary note on life history studies of European species of Milesia.**—*J. Arnold Arbor.*, xvi, 1, p. 143, 1935.

The author states that during her studies of the life-history of fern rusts in England she was successful in obtaining spermogonia and aecidia of *Milesia scolopendrii* and *M. polypodii* on *Abies alba* and *A. concolor*, and of *M. vogesiaca* and *M. kriegeriana* on these two hosts as well as on *A. grandis* [cf. *R.A.M.*, xiii, pp. 412, 656].

RAYNER (M. C[HEVELEY]). **Mycorrhiza in relation to forestry. I. Researches on the genus Pinus, with an account of experimental work in a selected area.**—*Forestry*, viii, 2, pp. 96–125, 13 pl., 1934.

In a detailed study [which is fully described] of the physiological relations between mycorrhiza and host in *Pinus* seedlings [*R.A.M.*, xiii, p. 530], small field plots were laid out in a locality in the south of England where sowings of *Pinus* had yielded poor and inconsistent results, the method adopted involving the application of humus inoculum known to contain active mycorrhizal material and the checking of the results by similar applications to pot cultures in a sterilized soil known to be favourable to growth and mycorrhiza production.

The root systems of many of the seedlings already present in the area selected were very defective, the younger regions of the roots tending to rot with no definite symptom of fungal attack; mycorrhizas were absent or abnormal. Humus inoculations containing active mycorrhiza of the species concerned were carried out on *P. sylvestris*, *P. laricio*, and *P. pinaster* before sowing, material to treat the Scots pine being obtained from Sweden and Ireland and that for the other two species from

Corsica. The result of the inoculation was improved growth and mycorrhiza formation by the seedlings, which in marked contrast to the controls continued to make steady growth, the needles being green and of normal length and the root systems well branched with freely developed mycorrhizas of the same structural types as those in the inoculum. The beneficial effect was general, indicating that the stimulating effects were due to biological factors rather than to manuring. Similar results were obtained on Scots pine growing in a sterilized rooting medium.

Observations showed that while mycelium of one or more fungi capable of forming normal mycorrhiza with all the pines studied was naturally present throughout the area concerned, soil factors inimical to its symbiotic activity and proper functioning were responsible for the condition of the original sowings. This conclusion was confirmed by the reaction of the seedling roots in field plots and in pot cultures of the same soil subjected to treatments (e.g., with phosphatic fertilizers) designed to remedy this hypothetical soil condition.

Results in the field and laboratory provided independent proof of the extreme sensitiveness of young tree roots to environmental conditions affecting nutrition and mycorrhiza development. In the soil of the area concerned the sickly state of the plants was largely due to nitrogen starvation. Experiments with inorganic nitrogenous fertilizers showed that it was difficult to make up for deficiencies in this way without serious disturbance of the root-shoot growth ratio in certain species of pine, but it was demonstrated that the nutrient requirements of the young trees are met by a proper mycorrhiza development.

It was found that certain organic composts prepared so as to remove much of the cellulose and provide a dressing rich in proteins, nucleic acid compounds, and lignin had a remarkable effect in the soil in question in stimulating the development and degree of branching of the long roots; sublaterals were freely produced, and mycorrhiza formation was no longer inhibited. In general, the results supported the hypothesis that inhibition of mycorrhiza formation in the area concerned was conditioned by the organic constituents of the soil and could be relieved by treatments modifying them. The results also showed that the organic composts that brought about these changes could be used effectively for studying the mycorrhizal activity of coniferous seedlings in response to variation in the root environment.

Liese (J.), Nowak (A.), Peters (F.), & Rabanus (A.). **Toximetrische Bestimmung von Holzkonservierungsmitteln. Zusammenfassender Bericht.** [The toximetric determination of timber preservatives. Summary report.]—*Beih. 'angew. Chem.'*, 11, 18 pp., 8 figs., 1 diag., 2 graphs, 1935.

Further particulars are given of the methods officially adopted at the International Conference of Mycologists and Wood Preservation Technicians held in Berlin in June, 1930, for the toximetric determination of timber preservatives [*R.A.M.*, x, p. 356; xiv, p. 3], and the results of tests of these methods since carried out on a co-operative basis at several centres are discussed.

The following fungi were selected as suitable for experimental use:

Coniophora cerebella [*C. puteana*], *Polyporus vaporarius* [*Poria vaporaria*], *Lenzites abietina*, *Lentinus squamosus* [*L. lepideus*], *Polystictus versicolor*, and *Daedalea quercina*, pure cultures of which are obtainable from the silvicultural plant protection headquarters (Hauptstelle für forstlichen Pflanzenschutz) at Eberswalde, Germany. As a result of the experience gained it is recommended that the determination of the amount of decay in the test-blocks should be made by two methods, gravimetric and manual, according to the requirements of the case. The gravimetric method should be used on beech, the manual on pine, and both on all other woods pending a decision as to the more convenient technique in a given case.

Details of both methods are furnished. All tests should be made in glass flasks, Kolle flasks of standard dimensions being recommended. In the gravimetric method a series of wood-blocks, weighed to tenths of a gramme after drying at 105° C. to a constant dryness, are impregnated with various quantities of the preservative to be tested and placed, together with one untreated, weighed block to each series, in the flasks on pure cultures of the wood-destroying fungi. The following groups of substances are suitable for wood preservation tests: (*a*) water-soluble substances in aqueous solution; (*b*) substances insoluble in water in appropriate solvents (e.g., acetone); and (*c*) substances insoluble in water—especially oils—or solutions of such substances in appropriate fluids, in aqueous emulsion. For 10 to 20 minutes the blocks should be immersed in the test preparation under a vacuum of 60 to 65 cm. of mercury, on the removal of which they should continue to lie in the fungicide until completely saturated. They are then weighed to tenths of a gramme to ascertain the quantity of the solution absorbed. Where organic solvents have been used the impregnated blocks must be exposed to air until the solvent is dispelled as completely as possible. At the end of a given time (three to four months) after inoculation the blocks are removed, freed from the adhering mycelium, and again weighed to tenths of a gramme at their original degree of dryness, which is attained by several hours' heating at 105° and cooling in an exsiccator, the loss of weight being the criterion for the extent of wood destruction. Details are given of the methods recommended to calculate the loss, if any, due to evaporation or otherwise during the test of some of the material used for impregnating. The manual method consists merely in the impregnation of the air-dried blocks under controlled conditions as already indicated, and the estimation, by observation and manipulation, of the amount of injury caused after a given period by the test fungi. Five grades of decay are recognized, from none to full destruction.

Malt extract agar (50 and 30 gm., respectively, brought up to 1,000 gm. with distilled water) has been found to constitute a suitable medium for the cultures of the wood-rotting fungi, the methods of establishing which are briefly indicated. They are ready for use in one to two weeks after subculturing. The impregnated blocks are kept from lying directly on the medium by glass rods so as to prevent diffusion of the antiseptic into the medium. Pine sapwood is the most generally useful material for timber preservative trials, but any other kind of wood may be employed as circumstances dictate, e.g., beech for *P. versicolor* [see next abstract]. A block size of $1{\cdot}5 \times 2{\cdot}5 \times 5$ cm. is con-

venient. The experimental flasks should be kept at a temperature of 18° to 22° and a relative humidity of 60 to 70 per cent., and shielded from direct sunlight. In the gravimetric method a loss of weight equivalent to at least 5 per cent. must be sustained before the block is considered to be attacked, while in the case of the manual technique the disintegration of the wood must be plainly recognizable to warrant a report of infection by a given fungus. The toxicity limit is calculated as the interval between the concentration of a preservative permitting decay and that inhibiting it, expressed in kg. per cu. m. of wood.

JAY (B. A.). **A study of Polystictus versicolor.**—*Kew Bull., 1934,* 10, pp. 409–424, 2 pl., 3 figs., 2 graphs, 1934.

Polystictus versicolor [*R.A.M.*, x, p. 343; xiii, p. 485] is stated to be responsible for most of the rotting of felled and structural hardwoods under damp conditions in Great Britain, where it is extremely widespread and has even been recorded to cause rot in the wooden frames of car bodies. It has not been observed by the author on living trees although reported in America as the cause of a heart rot canker in apple and pear trees [ibid., vi, p. 167]. On 2 per cent. malt agar the fungus entirely decolorized the medium in three or four weeks, this being considered a useful test in identifying the fungus. Diploid mycelium was formed only when two monosporous cultures were grown together. The spores retain their viability for considerable periods (at least for three months when kept dry on a cover slip). Maximum growth occurred at P_H values between 4·6 and 5·6, no growth taking place below P_H 3 or above 7·3. The lowest temperature necessary to kill the fungus in 15 minutes was 60° C. in culture and 65° in wood. In culture the fungus appeared to grow slightly better in darkness than in light.

In artificially inoculated blocks of elm and oak wood, *P. versicolor* penetrates along the vessels and the medullary rays, the latter being the first to be attacked; later the wood parenchyma cells are affected and the smaller vessels are filled with dense strands of hyaline hyphae greatly varying in size; clamp-connexions are somewhat less frequent than in artificial cultures, and 'medallions' are very rare. The host cells appear to be penetrated equally easily by the hyphae both through the pits and through their walls. Zone lines, caused by the accumulation in the wood elements of a reddish-brown gummy substance, were only observed in oak. The haploid mycelium arising in monosporous cultures was shown to attack and rot wood as vigorously as the diploid.

The results of tests [which are briefly described] of the reaction of the fungus to sodium fluoride, creosote, zinc chloride, and formalin vapour, showed that creosoting is the best preventive of this form of rot. Early removal from the forest and drying of the felled tree trunks is very advisable. Where creosoting is not possible, e.g., in the construction of car bodies, impregnation with 4 per cent. sodium fluoride is recommended; this should be effective so long as the wood is kept from contact with water.

LATHAM (J.) & ARMSTRONG (F. H.). **The mechanical strength properties of 'brown' Oak.**—*Forestry,* viii, 2, pp. 131–135, 1934.

Experiments at the Forest Products Research Laboratory, Princes

Risborough, made to determine the effect of the condition known as 'brown oak' [*R.A.M.*, xiv, p. 136] on the mechanical properties of the timber showed that while partially infected wood did not differ in strength or density from normal oak, completely infected wood, though equal in density to timber from normal trees of the lowest weight and strength found, was markedly softer and more brittle. It is, therefore, assumed that the fungus associated with the condition has only very feeble wood-destroying properties in the early stages of infection.

Ogilvie (L.) & Mulligan (B. O.). **Vegetable diseases : a survey of recent work at Long Ashton.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iii, pp. 119–125, 6 figs., 1935.

Short, popular notes are given on diseases of asparagus, beans [*Phaseolus vulgaris*], leeks, lettuce, mint, peas, and vegetable marrow observed chiefly in the Evesham and Cheltenham areas of Bristol Province since September, 1932. Much of the information given has already been noticed from another source [*R.A.M.*, xiii, p. 667].

Potts (G.). **Experiments on finger-and-toe disease (Plasmodiophora brassicae).**—*Trans. Brit. mycol. Soc.*, xix, 2, pp. 114–127, 1935.

In the experiments described in some detail in this paper (a preliminary account of which was given at the British Association in Johannesburg in 1905) negative results were obtained from all attempts to infect with *Plasmodiophora brassicae* certain plants nearly related to the Cruciferae or having a similar ash composition, including *Reseda odorata*, *Corydalis glauca*, *Fumaria officinalis*, *Allium schoenoprasum*, *Urtica pilulifera*, and spinach. Among the Cruciferae, the injury done by the organism depends on the host species and its age at infection; in diseased roots of species not obviously injured by the tumour formation, the vessels were found to be enclosed in a hard central fibrous strand, and not to be disturbed by the pathological cell proliferation of the surrounding parenchyma, while in species that showed considerable direct injury the continuity of the vessels was broken. The tests also showed that the development of the disease is promoted by acidity and checked by alkalinity of the soil, and that it can be entirely prevented by applications of quicklime to the growing crop, provided the dressings are sufficiently large and frequently repeated; besides its effect on soil reaction lime controls the disease in some other, as yet unknown, manner, this effect taking a considerable time to become apparent. While highly calcareous soils are not immune from the disease, those that are naturally rich in calcium are much less subject to it than those that are deficient. Applications of sulphate appeared to encourage the development of club root, as judged by its earlier appearance. Organic matter may also encourage the disease by favouring the retention of soil moisture. The spores of *P. brassicae* were shown to be able to infect plants to a depth of 12 inches in the soil.

Blank (L. M.). **A mosaic on Cabbage in Wisconsin.**—Abs. in *Phytopathology*, xxv, 1, p. 6, 1935.

Mosaic has been found to be prevalent on cabbage in the field in south-eastern Wisconsin, where the symptoms of the disease include

faint or conspicuous mottling and necrosis and shedding of the lower affected leaves. Transmission has been accomplished by aphids and plant juice. Plants affected early in the season are liable to stunting.

De Bruyn (Helena L. G.). **Heterothallism in Peronospora parasitica.**—Abs. in *Phytopathology*, xxv, 1, p. 8, 1935.

No appreciable differences in pathogenicity to cabbage seedlings or growth rate were observed between eleven single-spore isolations from *Brassica* of *Peronospora parasitica* [*R.A.M.*, xiv, p. 1], but there were distinct variations in oospore development. Three strains were homothallic, producing an abundance of oospores under suitable conditions. Seven behaved unisexually, forming oospores only on contact with a strain of the opposite thallus group. The eleventh was fertile in a small percentage of the tubes either alone, with another strain of the same group, or (more abundantly) with a strain of the other group. This strain, therefore, was potentially bisexual with one sex predominating. Of the eight heterothallic strains, four belonged to one group and four to the opposite, as proved by intercrossing.

Osborn (H. T.). **Incubation of the virus of Pea mosaic in the aphid, Macrosiphum gei.**—Abs. in *Phytopathology*, xxv, 1, p. 31, 1935.

The pea mosaic virus, which has already been shown to require some twelve hours' incubation in the aphid *Macrosiphum pisi* before transmission by this carrier [*R.A.M.*, xiii, p. 414], has been found to undergo a similar period (12 to 18 hours) of maturation in *M. gei*. A second virus affecting peas and other legumes, designated pea mosaic virus No. 2, is readily transmissible by mechanical means and is also spread by both the above-mentioned aphids. *M. pisi* transmits the latter virus (apparently by mechanical means) within 30 minutes of acquiring it, and does not usually retain it for more than an hour.

Suit (R. F.). **Preliminary report on investigations of bacterial blight of Beans.**—*Rep. Quebec Soc. Prot. Pl., 1932–1934*, pp. 75–79, 1934.

Field observations in Quebec showed that the principal bacterial blight of beans [*Phaseolus vulgaris*] present locally is that due to *Pseudomonas* [*Bacterium*] *phaseoli*. Rainfall appeared to be the determining factor in the seasonal development of the disease [*R.A.M.*, xii, p. 415]. All of seven named varieties tested were susceptible except the late maturing Scotia. The Tepary bean (*P. acutifolius* var. *latifolius*) also showed resistance. The rogueing of susceptible varieties gave no control, but selections of plants showing the least disease among seven varieties grown in 1933, resulted in obtaining 5 to 30 selections from each variety which are to be further tested for resistance.

Stapp (C.). **Fortgeführte Untersuchungen über die Resistenzverschiedenheiten von Bohnen (Phaseolus vulgaris) gegen Pseudomonas medicaginis var. phaseolicola Burk.** [Further investigations on the differences in resistance of Beans (*Phaseolus vulgaris*) to *Pseudomonas medicaginis* var. *phaseolicola* Burk.]—*Angew. Bot.*, xvii, 1, pp. 23–42, 1 fig., 1935.

Absolute resistance to grease spot (*Pseudomonas* [*Bacterium*] *medicaginis* var. *phaseolicola*) was shown in the writer's further varietal tests

on samples of varying origin [*R.A.M.*, xiii, p. 557; xiv, p. 72] by Kaiser Wilhelm, Doppelte holländische Prinzess (with which Zucker-Butter-Brech may be identical), Zucker Perl, Schwert (Hamburger Markt, Nordstern, and Holländische), Mombacher Juni, Marktsieger, Wachs Black Roman string, Wachs Neger, Wachs Flageolet (red and dark purple beans), standard Schlachtschwert (Sachs), stringless Krummschnabel, stringless Konserva (Mette), Konserva, Konservanda Original Sachs, Mohrenweisers Wunder-Butter-Wachs, and climbing earliest Inexhaustible (Mette). Marked susceptibility again characterized Non Plus Ultra, the majority of the Hinrichs Riesen samples, Ilsenburg speckled, Flageolet St. Andreas and rote Pariser, Wachs Dattel, and (in contradiction of previous results) Wachs Mont d'Or.

WINGARD (S. A.). **Host-parasite relationship in Bean rust.**—Abs. in *Phytopathology*, xxv, 1, p. 39, 1935.

Histological study shows that the bean [*Phaseolus vulgaris*] varieties commonly regarded as resistant to rust [*Uromyces appendiculatus*: *R.A.M.*, xiii, p. 205] are actually hypersensitive. In such plants the leaf tissues succumb to invasion by the fungus and destroy the latter before spores can be produced. In susceptible varieties, on the other hand, the invaded tissues are not killed by the rust but stimulated and preserved at the expense of the sound ones. The invaded host cell colonies, together with the encroaching hyphae, are considered to constitute parasitic units living at the expense of the surrounding healthy tissue. This symbiotic relationship between rust hyphae and host cells continues until after spore production and the consequent inability of the plant tissues to supply further nourishment.

ANDRUS (C. F.) & MOORE (W. D.). **Colletotrichum truncatum (Schw.), n.comb., on garden and Lima Beans.**—*Phytopathology*, xxv, 1, pp. 121–125, 2 figs., 1935.

A Latin diagnosis is given of *Colletotrichum truncatum* (Schw.) n.comb. (syn. *Vermicularia truncata* Schw., *V. polytricha* Cke, and *C. caulicolum* Heald & Wolf [*C. caulicola*: *R.A.M.*, xi, p. 149]), which causes a reddish, later light-brown or greyish stem and pod blight on garden and Lima beans (*Phaseolus vulgaris* and *P. lunatus*) in the southern and eastern United States. The fungus is characterized by black, hemispherical, rugulose acervuli, mostly horizontally truncate, more rarely irregularly conical-truncate; abundant filiform setae of very variable length (60 to 300 by 3·5 to 8 μ); and falcate, lanceolate, hyaline conidia, 18 to 30 by 3 to 4 μ. Numerous dark sclerotial bodies simulating pycnidia are produced by the organism, but true pycnidia have not been observed in any of the material examined.

WEBER (G. F.). **An aerial Rhizoctonia on Beans.**—Abs. in *Phytopathology*, xxv, 1, p. 38, 1935.

During the past two years beans [*Phaseolus vulgaris*] have been attacked in Florida by a disease similar to that produced on the fig [in the same State] by *Rhizoctonia microsclerotia* [*R.A.M.*, iv, p. 443] and probably identical with a blight of the Japanese varnish tree, *Firmiana simplex*. All the aerial parts of the bean are affected, the symptoms

being most evident on the foliage. The leaf blades are killed from the base as the fungus spreads over them in typical thread blight fashion from the stem and petiole. The hyphae appear to be both subcuticular and superficial, the former invading and killing the host cells while the latter extend over the laminae. The attacked areas first appear scalded and then dry out, often turning brown. Beans were not hitherto known to suffer from this disease, other hosts of which include Fordhook Lima beans [*P. lunatus*], *Xanthium americanum* [*X. canadense* Mill.], and *Glycine apios* [*Apios tuberosa* Moench]. The sclerotia formed in nature on bean and fig are similar.

Schmidt (E. W.). **Das Vergilben der Zuckerrübenblätter.** [The yellowing of Sugar Beet leaves.]—*Dtsch. Zuckerindustr.*, lx, 1, p. 20, 1935.

In addition to the normal yellowing of sugar beet leaves accompanying senescence, a number of other agencies may produce exactly the same effect, including mosaic, parasitic fungi, nutritional deficiency (primarily of nitrogen, then of potash), smoke injury, intense sunlight (reported only from the vicinity of Madrid), and the disease known in Holland as yellowing, ascribed by Quanjer to a virus [*R.A.M.*, xiv, p. 209]. An analysis is given of the chemical processes involved in senescence, based on the writer's studies at the Kleinwanzleben (Germany) Research Institute.

Stuart (W. W.) & Newhall (A. G.). **Further evidence of the seed-borne nature of Peronospora destructor.**—Abs. in *Phytopathology*, xxv, 1, p. 35, 1935.

After repeated failures in the greenhouse to obtain diseased seedlings from onion seed suspected of carrying *Peronospora destructor* [*P. schleideni*: *R.A.M.*, xii, p. 484], the writers inoculated in the autumn flowering seed heads of Yellow Globe with a conidial suspension of the fungus, natural infection by which also occurred freely from a neighbouring field. In the following spring seed from the infected heads was sown in two isolated virgin muck fields, in one of which, surrounded on three sides by dense woodland and 1,200 ft. distant from the nearest onion stand, mildew developed simultaneously with its appearance in other local commercial plantings.

Drechsler (C.). **Occurrence of a species of Aphanomyces on roots of Spinach and Flax.**—Abs. in *Phytopathology*, xxv, 1, pp. 14–15, 1935.

A species of *Aphanomyces* probably identical with *A. cladogamus* has been isolated from the discoloured roots of spinach in Virginia and New Jersey and flax in Wisconsin. The dimensions of the newly observed species agree closely with those of *A. cladogamus*, while the oogonial and antheridial relations are also similar in both. The yellowish to orange spotting on the root surface is accompanied by a considerable degree of softening, but no general decay was noticeable at the time of collection.

Cook (H. T.). **Occurrence of oospores of Peronospora effusa with commercial Spinach seed.**—Abs. in *Phytopathology*, xxv, 1, pp. 11–12, 1935.

Commercial spinach seed of different varieties and origins was found

to have an admixture of oospores of *Peronospora effusa*, the agent of downy mildew [*R.A.M.*, xiv, p. 141], to a maximum extent of one oospore to 8½ seeds. The crop grown from heavily infested seed in 1932 was badly damaged by the mildew, as also was that raised from the same lot of seed planted on new land in 1933.

STAPP (C.). **Eine bakterielle Fäule an Lactuca sativa var. capitata L. und Cichorium endivia L.** [A bacterial rot of *Lactuca sativa* var. *capitata* L. and *Cichorium endivia* L.]—*Zlb. Bakt.*, Abt. 2, xci, 11–15, pp. 232–243, 3 figs., 1935.

Particulars are given of a rot of head lettuce and endives in central Germany, of a similar general character to that previously described on the latter host by W. Kotte as due to *Pseudomonas endiviae* [*R.A.M.*, ix, p. 503]. The dimensions of the uni- to pluriflagellate, Gram-negative, green-fluorescent organism isolated in the present studies from both plants varied considerably on different media, averaging 1·4 to 2·8 by 0·4 to 0·5 μ, 1·0 to 2·8 by 0·4 to 0·5 μ, and 1·2 to 2·2 by 0·5 to 0·6 μ on bouillon, potato, and carrot agars, respectively. The optimum temperature for the development of the bacterium lies between 23° and 28° C., with a minimum below 0°, a maximum from 40° to 42°, and a death point of 51° to 52°. Milk is coagulated by the bacterium, which further causes strong denitrification. The organism being also pathogenic to chicory, it is believed to be in all probability identical with *P. intybi*, described by D. B. Swingle from the United States [ibid., v, p. 275]. Lettuce was also infected in inoculation tests by *P. syringae* both from lilac and *Chrysanthemum indicum* [ibid., xiv, p. 38], and serological tests indicated a certain affinity between the lettuce organism and other fluorescent species such as *P. syringae*, *P.* [*Bacterium*] *lacrymans*, and *P. tabaci* [*Bact. tabacum*].

NELSON (R.) & COCHRAN (L. C.). **Three forms of the Fusarium wilt of Celery.**—Abs. in *Phytopathology*, xxv, 1, p. 29, 1935.

A form of the *Fusarium* wilt or yellows of celery differing from the two commonly known in Michigan and elsewhere [*R.A.M.*, xiv, p. 142] has recently been found in California. Of the two widely distributed forms, (1) is characterized in the initial stages by a progressive yellowing of the lamina (primarily the interveinal areas), and absence of curling, while in (2) downward curling of the leaflets is conspicuous, accompanied by blanching of the veins and a narrow band of immediately adjacent tissue. The new form (3) involves neither curling nor discoloration of the leaflets but causes dwarfing and other symptoms [see next abstract].

NELSON (R.) & COCHRAN (L. C.). **Taxonomy of the Fusaria that cause Celery wilt (yellows).**—Abs. in *Phytopathology*, xxv, 1, p. 29, 1935.

Two of the groups of *Fusarium* strains associated with celery wilt or yellows have been found to be morphologically indistinguishable both from one another and from other parasitic members of the subsection *Orthocera*, which differ mutually only in certain minor details. Their specific separation on the grounds of the slight and variable differences in spore size appears to be unwarranted. The logical taxonomic procedure would be to recognize only one species of this

subsection, viz., *F. lini* [*R.A.M.*, xiv, p. 310]. This treatment, however, being unsatisfactory alike to systematists and phytopathologists, it is proposed to make host relationships the primary basis in the classification of the parasitic *Fusaria*. On this basis the two well-defined groups of celery *Fusaria* are named *F. apii* and *F. apii* var. *pallidum*, while a third group [see preceding abstract] requires further study.

Korff (G.) & Böning (K.). **Die Meerrettichschwärze und ihre Bekämpfung.** [Blackening of Horse-radish and its control.]—*Prakt. Bl. Pflanzenb.*, xi, 9–10, pp. 273–277, 2 figs., 1934.

Notes are given on the destructive 'blackening' disease of horse-radish caused by *Verticillium dahliae* [*R.A.M.*, vii, p. 357 and next abstract] in Germany and on its control by appropriate cultural measures.

Klebahn (H.). **Untersuchungen über Krankheiten des Meerrettichs.** [Investigations on Horse-radish diseases.]—*Z. PflKrankh.*, xlv, 1, pp. 16–41, 15 figs., 1935.

The two principal horse-radish diseases on the Elbe island of Finkenwärder, Germany, are stated to be a black rot of the roots and white rust [blister] (*Cystopus candidus*). The author's studies show that the former disease is not attributable to *Verticillium dahliae*, found by Korff and Böning and others to cause a wilt of the crop [*R.A.M.*, vii, p. 357; ix, p. 156 and preceding abstract]. Hyphae resembling those of *V. dahliae* were detected in the vessels in a few cases, but never in association with the typical blackening of the root, nor were its characteristic minute sclerotia present. Other organisms were also present but the results of inoculations with them have so far been inconclusive, so that the cause of the disease remains obscure.

C. candidus was observed to overwinter in the roots in the form of a perennating mycelium [ibid., xi, pp. 490, 688], the individual hyphal elements of which are thick-walled, often curved, bent, or branched, with spherical swellings at the ends and elsewhere, and measuring 8 to 12 μ in diameter. Haustoria are formed from the intercellular hyphae.

The control of the blackening disease should be based primarily on the selection of healthy material for cuttings, while white blister, which spreads from leaf to leaf, may be combated by spraying with Bordeaux mixture.

Leach (J. G.) & Currence (T. M.). **Resistance to Fusarium wilt in Muskmelon.**—Abs. in *Phytopathology*, xxv, 1, p. 25, 1935.

Muskmelon wilt (*Fusarium*) [*niveum*: *R.A.M.*, xiv, pp. 86, 216, 220] is stated to be spreading continuously in the Minneapolis and St. Paul districts of Minnesota [ibid., xii, p. 744], where the disease, first observed in 1931, occurs in a very destructive form. Partial resistance has been shown in varietal trials by Honeydew and Persian, the remaining common commercial sorts being very susceptible. One of some 30 plants selected in 1932 from a field of the Golden Osage type was apparently a hybrid between Golden Osage and Honeydew, and in 1933 it yielded a number of resistant plants, from which further selections have been made.

Orton (C. R.). **Dissociation of Fusarium niveum in soil.**—Abs. in *Phytopathology*, xxv, 1, pp. 30–31, 1935.

Forty-two 2-litre Erlenmeyer flasks half-filled with sandy-loam greenhouse soil were sterilized and infested with nine strains of *Fusarium niveum* [the agent of melon wilt: see preceding abstract] in March and August, 1933, six further flasks being left untreated as controls. Sixteen of the flasks were placed in the laboratory, 16 in a greenhouse, and 16 in a 6-in. soil trench out-of-doors. At approximately monthly intervals samples were removed from each flask and plated on agar. Each colony thus obtained was studied in comparison with its respective 'parental' strain and three groupings made, viz., (1) colonies like parental strain; (2) colonies unlike parental strain ('colony dissociants'); and (3) colonies showing sectorial dissociation. In the 8,220 colonies isolated from the 48 flasks, colony dissociants appeared 25 and sectorial dissociants 16 times from seven strains; twelve of the colony and thirteen of the sectorial dissociants were distinctive, the remainder being replications.

Young (P. A.). **Sclerotinia rot of Pumpkin and Squash.**—Abs. in *Phytopathology*, xxv, 1, pp. 39–40, 1935.

Field and storage decay of pumpkins and squashes due to *Sclerotinia sclerotiorum* was reported from Montana in 1933 [cf. *R.A.M.*, viii, p. 419]. Affected squashes showed disk-shaped, water-soaked spots, 2 to 10 cm. wide, the margins of which were often studded with droplets of a yellow exudate, while the centres sometimes bore a white mycelium. Many large sclerotia were found in the dried mummies. In pumpkins the rot was of the soft, liquid type and was associated with dense mycelial production, numerous black sclerotia being also formed, up to 15·5 cm. in length and 12 cm. in breadth.

Zacharewicz (E.). **La Truffe. Sa culture.** [The Truffle. Its cultivation.]—*Progr. agric. vitic.*, ciii, 1, pp. 10–14; 3, pp. 59–62, 1935.

This is a summarized account of the methods employed in the Vaucluse department of France for the artificial establishment of truffle-producing woods, chiefly of species of oak; it is pointed out, however, that some other trees such as, for instance, the pine, poplar, and hazel, are also suitable for this purpose. In well-established and well-maintained woods the productivity in truffles may be as high as 100 kg. per hect. per annum.

Branas (J.) & Bernon (G.). **Époque des traitements du mildiou de la vigne.** [Date of treatments against Vine mildew.]—*Ann. Éc. Agric. Montpellier*, N.S., xxiii, 2, pp. 67–95, 1 fig., 3 graphs, 1934.

After discussing the two methods of predicting attacks of vine mildew [*Plasmopara viticola*] at present in use in the French forecasting stations [cf. *R.A.M.*, iii, p. 468; xii, p. 73], the authors describe a new technique based mainly on data afforded by the vine itself, and depending on biometrical, pathological, climatological, and cultural factors.

Details are given of a method of calculating the ratio of unsprayed to sprayed leaf area. The number of applications required depends primarily on vegetative vigour, as this determines the vine's growth rate and amount of unsprayed (new) surface. Other things being equal, the

applications should be effected at intervals corresponding to a definite increase in branch length, i.e., 14 treatments made on a branch which finally reaches a length of 220 cm. should be given at intervals corresponding to an increase in branch length of 15 cm.

As regards the pathological factors, even after the first invasion from the soil, few, if any, lesions are present; after the first onset following the 7 to 10 days' incubation period, a new attack occurs, and as a rule becomes generalized throughout the vineyard. Thus (provided the atmospheric temperature is high enough for infection to occur), the third contaminating shower, coming at least 16 days after the one responsible for the initial outbreak, is the first dangerous one, before which, even in circumstances favouring infection, spraying is unnecessary. Directly favourable conditions prevail, fresh conidia are produced in a few hours, their abundance depending on the number, size, and condition of the lesions.

These factors exercise an indirect influence on the number of applications required. If only very few conidia are present in a wide area round the vineyard only one application need be made for each 25 or 30 cm. increase in branch length. When no conidia are present only the first few applications are necessary.

Climatological factors, by influencing the growth rate of the vines and the number of conidia produced, also indirectly affect the frequency with which spraying is required. Low atmospheric temperatures assist control both by reducing conidial production and by lessening the vine's growth rate; high temperatures dry up the conidia but stimulate vegetation. High atmospheric humidity favours infection by increasing the turgescence and sensitiveness of the vine tissues and assisting the liberation and conservation of the conidia. Rain, by reducing the atmospheric temperature, reduces the growth rate of the vines, but it also increases spore production. The most important factor in this connexion is the length of time the rain drops persist on the herbaceous organs, a prolonged light drizzle being much more dangerous than a sharp, heavy shower.

Assuming it to be established that it is dangerous to leave 15 cm. branch growth untreated, the investigations at Montpellier have shown that vines whose average branch length finally exceeds 2·30 m. require at least 17 applications to secure complete protection, the corresponding numbers for branch lengths of 1·8 to 2·3 m. and under 1·8 m. being 13 to 17 and under 12, respectively. Once the fruit bunches can no longer be reached by liquid sprays, recourse must be had to dusting.

Branas (J.) & Dulac (J.). **Sur le mode d'action des bouillies cupriques.** [On the mode of action of cupric mixtures.]—*Ann. Éc. Agric. Montpellier*, N.S., xxiii, 2, pp. 104–114, 1934.

Further investigations [which are fully described] into the mode of action of the copper compounds used against *Plasmopara viticola* [*R.A.M.*, xiv, p. 75], mainly in order to explain their failure in seasons of severe infection, showed that although the copper spray fluids in general use do contain enough copper (over 1 part in 100,000) [ibid., xiii, p. 423] to be toxic to the conidia of *P. viticola* when freshly prepared, the desiccated deposits do not, with certain exceptions, release this proportion of soluble copper when in contact with rain water. The

exceptions are (1) mixtures which do not dry up (which explains the effectiveness of spraying during moderate rain), (2) Burgundy mixtures which have become desiccated slowly and Bordeaux mixtures which have dried rapidly (though this solubility does not persist), and (3) deposits which come into contact with very acid rain water (P_H 4·6).

SCURTI (F.) & PAVARINO (G. L.). **Sulla scottatura dell' Uva. Esperienze eseguite sull' Uva Regina.** [On Grape scald. Experiments on Regina Grapes.]—*Ann. Sper. agr.*, xv, pp. 19–22, 3 col. pl., 1934.

The grape trouble known as 'scottatura' [scald], which occurs sporadically in various countries, consists in an alteration of the skins of the berries produced by excessive sunlight or mechanical injuries at times of intense heat. The affected berries are dark and noticeably wrinkled. The authors' studies [which are described] showed that the condition is the result of a photochemical process which causes the chloroplasts and tannic materials in the cells of the skin to become disorganized; a further cause is high temperature, which produces coagulation and discoloration of the cell contents. In cold storage conditions the disorder is arrested, but as soon as the grapes are brought back into ordinary temperatures it again becomes active and fungal decays set in.

SCURTI (F.) & PAVARINO (G.). **L'anidride solforosa nella conservazione delle Uve da tavola.** [Sulphur dioxide in the preservation of table grapes.]—*Ann. Sper. agr.*, xv, pp. 79–90, 7 col. pl., 1934.

A full account is given of experiments in which 15 varieties of table grapes in cold storage were exposed for one hour to a current of air containing 2 per cent. by volume of sulphur dioxide [*R.A.M.*, xii, p. 46], all trace of the gas being subsequently removed by ventilation, and the treatment repeated after 15 days and again at intervals of not less than 10 days, whenever any trace of mould development appeared.

With all the varieties tested the disinfection inhibited the development of moulds; it had, however, particularly with certain varieties, an adverse effect on the grapes, causing the berries at the top of the bunch to turn yellow in the part round the peduncle, this discoloration later darkening and spreading uniformly over half the surface of the berry. At the same time the juice became unpleasantly acid. In the susceptible varieties (which included Ohanez) it exercises a caustic and reducing action on the tissues, resulting in discoloration of the green organs and skin, with extensive burning. Under cold storage conditions these effects are followed by disorganization of the chloroplasts, alteration of the vascular system, and plasmolysis of the cells. The effects of the gas extend as far as the outer envelope of the seed. When such grapes are brought into room temperatures, breakdown of the tissues rapidly ensues. Black varieties are slightly more resistant to these effects than white ones.

Report on the work of the Agricultural Research Institutes and on certain other agricultural investigations in the United Kingdom, 1932–1933.—375 pp., 1935.

In this compilation (prepared on the same lines as that of the preced-

ing year) [*R.A.M.*, xiii, p. 214], greatly condensed accounts are included of the phytopathological work in progress at the various research stations, the laboratories of the Ministries of Agriculture for England and Northern Ireland, and the Department of Agriculture for Scotland, as well as the local investigations at advisory centres throughout the United Kingdom. Most of the information in question has already been noticed in this *Review* from other sources.

SALMON (E. S.) & WARE (W. M.). **Department of Mycology.**—*J. S.-E. agric. Coll., Wye*, xxxv, pp. 17–29, 2 figs., 1935.

In 1933, a severe attack of *Rhizoctonia* [*Corticium*] *solani* on the sprouts of early potato varieties on a Kentish farm led to a reduction in the net profit from the four-acre crop of the early varieties estimated at £70. In another attack by the same fungus on Arran Banner potatoes on Romney Marsh, sclerotia and mycelium were abundantly present on the roots and the white mycelium of the *Corticium* stage was found on the stems up to 3 in. above ground level and on some of the lowest leaves and petioles. Although the usual symptoms of *Rhizoctonia* infection in the early part of the season (dwarfing or stunting of the haulm and damage to the sprouts before they penetrate the soil) were not observed, the roots had apparently become infected sufficiently to cause the foliage to turn yellow.

During the summer several cases of failure in pea crops due to a *Fusarium* rot of the base of the stem were reported. Maize smut (*Ustilago zeae*) occurred in September on a fodder crop at Weybridge. Chives (*Allium schoenoprasum*) at Crowborough, Sussex, were attacked by the rust *Puccinia porri* [*R.A.M.*, xiii, p. 558]; a species of *Heterosporium* was also abundant on the dead or moribund leaves and there was a small amount of a *Colletotrichum* agreeing with *C. circinans* [ibid., i, p. 278; xii, p. 672] on the basal parts of the leaves and the neck of the bulb. The *Heterosporium* had much smaller spores than those of *H. allii* var. *cepivorum* previously recorded on onion leaves [ibid., xi, p. 423], the conidia found on chives measuring 25 to 38 by 8 to 12μ. A Bramley's Seedling apple fruit showing the presence of *Sphaeropsis malorum* [*Diplodia mutila*: ibid., xiii, p. 312] was received from storage in Jersey; the fungus is very rarely reported in England.

In June, 1934, the hops attacked the previous year by a severe form of split leaf [ibid., xiii, p. 355] were again affected, the leaves having split and showing an oily mottle and the bines being checked in growth. It was clear that the disease was spreading. A new disease resembling mosaic in many of its symptoms and apparently of the virus group was found on Fuggles hops and is under study.

FOËX (E.). **Quelques maladies qui ont attaqué les cultures pendant une période hivernale douce et humide.** [Some diseases attacking cultivated plants during a mild, damp winter period.]—*C. R. Acad. Agric. Fr.*, xxi, 5, pp. 196–198, 1935.

During the mild, damp spell prevailing in France during the last days of 1934 and the opening week of 1935, early wheat varieties, such as Mentana, were severely attacked by yellow rust (*Puccinia glumarum*) [cf. *R.A.M.*, xiii, p. 81; xiv, p. 77], while a few uredosori of *P. graminis*

were also detected on careful search. *Cercosporella herpotrichoides* and *Ophiobolus graminis* were found to have developed with unprecedented intensity on October-sown wheat [ibid., xiii, p. 568]. Barley showed leaf spots due to *Helminthosporium* (?) *teres* [ibid., xiv, p. 159] and an unidentified *Marssonina* [cf. ibid., vi, p. 721; viii, p. 302]. *Pseudopeziza medicaginis* was prevalent on lucerne. Spinach was heavily damaged in the Versailles region by *Pythium ultimum* [ibid., xiii, p. 5; xiv, p. 259] during November and December.

Pollacci (G.). **Rassegna sull'attività del Laboratorio Crittogamico di Pavia (Osservatorio Fitopatologico per le provincie di Cremona, Parma, Pavia e Piacenza) durante l'anno 1934.** [Report on the activity of the Cryptogamic Laboratory of Pavia (Phytopathological Observatory for the provinces of Cremona, Parma, Pavia, and Piacenza) during the year 1934.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV, vi, pp. 1–18, 1935.

In this report, which is on the same lines as those for previous years [cf. *R.A.M.*, xiii, p. 681], a summary is given of the work carried out in 1934 at the Cryptogamic Laboratory, Pavia, followed by a list (arranged under hosts, and containing a number of human and animal pathogens) of the diseases identified during the year. The season was marked by a very severe outbreak of vine mildew (*Plasmopara viticola*) which, in spite of every effort on the part of the growers, caused enormous damage both to the quantity and the quality of the crop. Repeated analyses of the different sorts of copper sulphate used by the growers demonstrated that the inefficacy of the spray applications was due, not to an inferior quality of the product used, but to persistent rain, which washed the mixture off the leaves before it could exert any fungicidal action.

Plagas del campo. Memoria del Servicio Fitopatologico Agricola. Año 1933. [Field pests. Report of the Phytopathological Agricultural Service for the year 1933.]—*Min. Agric., Dirécc. gen. Agric.*, Secc. 3a, 312 pp., 51 figs., 2 diags., 1 graph, 4 maps, 1934.

Following the lines of the previous year's report [*R.A.M.*, xiii, p. 176], brief surveys are given of the activities of the agricultural sections of the provinces and the national service of phytopathological inspection, as well as of the work of the eight Spanish phytopathological stations. An appendix on phytopathological legislation in Spain is included.

Die wichtigsten starken Schäden an Kulturpflanzen im Jahre 1934. [The principal severe damage to cultivated plants in the year 1934.] —*NachrBl. dtsch. PflSchDienst*, xiv, 12, pp. 115–118; xv, 1, pp. 9–10; 2, pp. 15–19; 3, pp. 29–33, 2 graphs, 21 maps, 1934–5.

Notes are given on the prevalence of some well-known diseases and pests affecting cultivated plants in Germany in 1934. Maps are given showing the distribution of several major diseases of cereals, potatoes, beets, vegetables, and fruit trees.

Eighth Annual Report of the Commonwealth Council for Scientific and Industrial Research for the year ended 30th June, 1934.—77 pp., 1935.

In the section of this report dealing with plant investigations (pp. 7–16) it is stated that of eighteen wheat varieties from China and Cyprus tested for resistance to the Australian form of flag smut [*Urocystis tritici*] only three showed a resistance comparable with that of the Nabawa variety [*R.A.M.*, x, p. 782]. Further evidence was obtained that *Wojnowicia graminis* is only weakly parasitic on wheat [ibid., xiii, p. 355]; under greenhouse conditions the fungus infected fourteen grasses, of which *Hordeum murinum* was the most severely attacked, being reduced in size by 30 per cent. and dying a week before the controls.

Investigations showed that in the control of tobacco frog-eye (*Cercospora nicotianae*) [ibid., xiii, p. 215] the first essential is to use disease-free seedlings. Seedlings grown from seeds taken from farms where the disease was prevalent in 1932–3 or 1933–4 developed the disease shortly after germinating. Seed sterilization (with 1 in 1,000 silver nitrate) [cf. ibid., xii, pp. 77, 753] was found effective in preventing seed transmission. Bordeaux mixture, copper emulsion, and colloidal copper all controlled the disease in the seed-bed, but variations in the curing methods did not appreciably reduce the barn spot form [ibid., xiii, p. 545].

An *Aphanomyces* causing root rot of peas was isolated from Tasmanian material.

It is estimated that by the time they mature at least 20 per cent. of the pine trees in New South Wales coastal plantations will have had their growth arrested and their commercial value practically destroyed, as a result of the 'needle fusion' disease [ibid., xiii, p. 356]; in some areas over 50 per cent. of the trees are affected, while in Queensland at least 60 per cent. are attacked. *Pinus pinaster* has in no instance shown any symptoms of the disease. Whether needle fusion is infectious or not is uncertain, though the evidence indicates that it may possibly be due to a virus. Eradication experiments in co-operation with the New South Wales Forestry Department are being carried out in two plantations with 17,000 trees.

HENRICK (J. O.). **A note on plant diseases.**—*Tasm. J. Agric.*, N.S., vi, 1, pp. 28–29, 1 fig., 1935.

The author gives a few notes on certain crop diseases observed at the end of 1934 in the northern half of Tasmania, among which the following may be mentioned. Clovers were fairly severely attacked by rust (*Uromyces trifolii*) [*R.A.M.*, xi, p. 423]; the Mt. Barker strain of subterranean clover, in particular, suffered greatly, all its aerial organs being destroyed within a week. In some areas market garden peas were ruined by downy mildew (*Peronospora viciae*) [ibid., xiv, p. 340]. There was also a rather unusual outbreak in great severity of powdery mildew (*Erysiphe graminis*) [ibid., xiv, p. 229] on the stems and leaves of wheat at the 'ears peeping' stage.

Pole Evans (I. B.). **Aiming at better pastures and field crops. Annual Report of the Division of Plant Industry.**—*Fmg. S. Afr.*, ix, 105, pp. 539–548, 568, 1 fig., 1934.

The following items of phytopathological interest occur in this report. No cases of citrus canker [*Pseudomonas citri*] having been observed in the Union of South Africa during the past six years, permission was given in 1934 for planting within the quarantined area 8,918 trees and 40,000 seedlings and for budding 6,150 trees [*R.A.M.*, xiii, p. 425].

Heavy losses (up to 75 per cent. of the crop) were sustained in the eastern Transvaal through a brown rot of tomatoes caused by a species of *Phytophthora*.

Promising results were given by experiments in varietal resistance to watermelon wilt [*Fusarium niveum*: ibid., xiv, p. 224].

Fruit rot of litchi [*Nephelium* litchi] has been found to be associated with three organisms, viz., a yeast responsible for the soft, pinkish type of decay, a *Pestalozzia* causing a white rot, and an unidentified fungus producing a greyish-black decay.

Helicobasidium compactum [ibid., xii, pp. 9, 425] has been definitely implicated as the agent of the disease of *Pinus longifolia* near Louis Trichardt to which reference has already been made [ibid., xiii, p. 425].

The following diseases new to the Union were identified during 1934: delphinium wilt (*Sclerotium rolfsii*) [ibid., xiv, p. 147], fig canker (*Phoma cinerescens*), hydrangea mildew (*Oidium polygoni*) [?*Microsphaera polonica*: ibid., xiii, p. 681; cf. also xiv, p. 146], sooty blotch of mango (*Gloeodes pomigena*), and vine excoriosis (*P. flaccida*) [ibid., xiv, p. 346]. Among the disturbances giving more trouble than usual were downy mildew of cucumbers [*Pseudoperonospora cubensis*: ibid., xi, p. 268], powdery mildew of mangoes [?*Erysiphe cichoracearum*: ibid., xi, p. 625], watermelon anthracnose [*Colletotrichum lagenarium*: ibid., xiv, p. 344], and the lawn grass infections due to *Helminthosporium* sp. (black blotch), *Rhizoctonia* [*Corticium*] *solani* (brown patch), and *R.* sp. (dollar spot) [see below, p. 449].

Smith (F. E. V.). **Annual Report of the Government Microbiologist, 1933.**—*Rep. Dep. Agric. Jamaica, 1933*, pp. 19–21, 1935.

After referring to the effect on different crops of the adverse weather experienced in Jamaica in 1933, the author states that the loss of banana land in the island from Panama disease (*Fusarium oxysporum cubense*) is rapidly increasing every year, some 2,000 acres being given up in 1933 alone. At this rate the quality as well as the quantity of the export trade will soon be affected, as the better lands, which produce the heavier fruit, are rapidly being abandoned [*R.A.M.*, xiii, p. 79; xiv, p. 378].

McDonald (J.). **Annual Report of the Senior Mycologist.**—*Rep. Dep. Agric. Kenya, 1933*, pp. 146–158, 1934.

Investigations by C. A. Thorold into the so-called 'Elgon die-back' of coffee in Kenya showed it to be non-parasitic and associated with lack of shade.

Twenty-one hybrid wheat varieties developed at the Njoro Plant Breeding Station were resistant to all four physiologic forms of stem

[black] rust (*Puccinia graminis*) found in Kenya [*R.A.M.*, xiii, pp. 222, 361]. Prolonged attempts to germinate locally-collected teleutospores of this rust by alternate freezing and thawing, and drying and wetting were unsuccessful and there is as yet no evidence that the barberry plays any part in the perpetuation of black rust in the colony. It is not yet known whether more than one physiologic form of *P. glumarum* is present in Kenya, but a collection of differential wheat varieties has been obtained from Gassner in Germany to test this point [ibid., xiii, p. 757]. Where wheat fields severely affected by *Ophiobolus graminis* [ibid., xiii, p. 217] were planted with oats, improvement occurred when wheat was again grown the following year. Symptoms closely resembling those of basal glume rot were observed on wheat ears, but though bacteria were abundantly present in the affected tissues none agreed completely with the description of *Bacterium atrofaciens* [ibid., xii, p. 430].

C. A. Thorold found the *Gibberella* stage of *Fusarium moniliforme* on maize stalks, spores from which gave rise in culture to the conidial stage; as this formed heads, not chains, the fungus is probably *F. moniliforme* var. *subglutinans* [*G. fujikuroi* var. *subglutinans*: see next page].

Mosaic appeared in some eighty acres of sugar-cane at Chemelil, Nyanza Province, newly planted with Ba 11403, Ba 11569, and B.H. 10 (12) after the eradication of all infected and uninfected Kampala canes [loc. cit.].

The new records made include oat crown rust (*P. coronata*) [*P. lolii*] and rye leaf rust (*P. dispersa*) [*P. secalina*].

HOPKINS (J. C. F.). **Southern Rhodesia: new records of fungus diseases for the year ending May 31st, 1934.**—*Int. Bull. Pl. Prot.*, ix, 2, pp. 30–32, 1935.

During the period from April to June, 1934, red locusts (*Nomadacris septemfasciata* Serv.) were extensively attacked by *Empusa grylli* [*R.A.M.*, xiv, p. 234].

Orange-rotting fungi observed during the administrative year included *Phytophthora citrophthora*, *Fusarium solani* [ibid., xiii, p. 631], *Trichoderma lignorum* [ibid., xiv, p. 163], *Diaporthe citri* [ibid., xiv, p. 161], *F. diversisporum* affin., *F. moniliforme* var. *erumpens* Wr. & Rg. affin., *F. oxysporum*, *F. lateritium* near var. *majus*, and *F. orthoceras*.

Rhizoctonia [*Corticium*] *solani* was responsible for black root and hard fruit rot of strawberries [ibid., xii, p. 489; xiii, p. 454].

DEIGHTON (F. C.). **Mycological work.**—*Rep. Dep. Agric. S. Leone, 1933*, pp. 14–20, 1935.

Early in 1933 tip and stem end rots of Cavendish banana [*Musa cavendishii*] fruit associated with *Gloeosporium musarum* were recorded at Njala, Sierra Leone; inoculation tests in the laboratory on half-grown and ripe fruits with *Helminthosporium torulosum* and *Stachylidium theobromae* (previously reported as a *Verticillium*) [*R.A.M.*, xii, p. 552], which are also associated with tip rotting, gave negative results but *G. musarum* readily infected the ripe fruit. A leaf speckle has been observed on all varieties of bananas and plantains at various places. The upper surfaces showed minute, very dark brown spots aggregated into patches of different sizes and shapes, but generally about an inch

across. Round the patches a yellow colour sometimes developed on the older leaves. On the lower leaf surface the spots were paler and more diffuse. The condition was associated with a *Rhinotrichum*, the speckles being formed by blocks of palisade cells killed by branch hyphae which penetrated the stomata on the under surface.

From two years' observations in the experimental cassava plot the greatest number of mosaic infections appear to occur during the rainy period (June to October); the Mayughe, Two Cent, Kono, and Cotton-tree varieties remained unaffected, though all were attacked in other parts of the country [cf. ibid., xii, p. 553]. Cases of apparent recovery were observed and experiments indicated that the disease is not seed-borne.

No scab [*Sporotrichum citri*: ibid., xii, p. 553] has yet been seen in Sierra Leone on native sour orange trees [*Citrus aurantium* var. *bigaradia*] except for a few small lesions on one tree. It seems reasonably certain that the disease was first introduced on grafted plants (grapefruit) from Florida in 1916. The fungus most commonly causing rotting of stored citrus from October to December was *Penicillium digitatum*, *Diplodia* [?*natalensis*] being rather less frequent, while *Colletotrichum gloeosporioides* was seldom found; *Oospora citri-aurantii* [loc. cit.] caused rotting of the pulp and rind of split fruit. A *Fusarium* rot provisionally attributed to *F. moniliforme* var. *majus* [ibid., xiii, p. 128] and var. *subglutinans* [*Gibberella fujikuroi* var. *subglutinans*: ibid., xiii, 300] was observed on wounded fruit.

The *Botrytis* associated with blossom-drop of avocado and *Jatropha* [*podagrica*: ibid., xii, p. 553] was identified as *B. cinerea*: it was again troublesome on avocado during the dry season.

Other records include *Myrothecium* sp. (probably *M. roridum* Tode) causing a leaf spot of *Impatiens holstii* hybrids; an *Oidium* (presumably *Erysiphe cichoracearum*) on okra [*Hibiscus esculentus*]; *Sclerotium coffeicolum* on *Jasminum pubescens* leaves, causing defoliation; the sclerotial stage of *Macrophomina phaseoli* on rotted papaw roots; *Fomes yucatanensis* [ibid., ii, p. 142; iii, p. 444] parasitic on *Cathormion altissimum*; *Hypocrella reineckiana* [ibid., xii, p. 553] on Lecaniid scales on *Ficus ovata*; the *Aschersonia* stage of *H. sphaeroidea* Syd. (*H. olivacea* Petch) on Lecaniid scales on *Phoenix dactylifera*; and *A. crenulata* on an Aleurodid on *Phyllanthus discoides*.

Forty-fourth Annual Report of the Alabama Agricultural Experiment Station for the fiscal year ending June 30, 1933.—32 pp., [? 1933. Received March, 1935.]

The following are some of the items of phytopathological interest in this report. J. L. Seal's continued studies on the disease of winter peas caused by *Mycosphaerella pinodes* and on those of winter peas and vetches [*Vicia* spp.] due to species of *Ascochyta* [*R.A.M.*, xi, p. 345; cf. also xiii, p. 611] showed that the first-named fungus is more generally responsible for damage than the others, which are, however, of common occurrence in field plantings of winter legumes. Failure of inoculation [with the nitrogen-fixing nodule bacteria] has been found to be an important factor in predisposing the crops to infection by these pathogens. The species of *Ascochyta* concerned in these diseases are stated to be

more commonly perpetuated in and on the seed than *M. pinodes*. All the organisms may subsist from year to year in the imperfect stage on plant refuse, while *M. pinodes* may also be found forming asci on débris during the late spring and summer. Storage of legume seeds over a four-year period results in the gradual disappearance of the fungi, but at the same time germination is so much reduced as to render this measure impracticable. Crop rotation, the use of healthy seed, and seed disinfection are advocated for the control of these diseases.

Two parasites of the pecan weevil (*C.* [*Balaninus*] *caryae*), *Metarrhizum anisopliae* [ibid., xiii, p. 94], and *Sporotrichum* [*Beauveria*] *bassiana* [ibid., xiv, p. 361] were successfully reared in large quantities on maize meal media by H. S. Swingle and J. L. Seal. Three applications of spores to the soil round pecans resulted in the apparent establishment of infection without, however, completely exterminating the larvae.

CHABROLIN (C.). **Notes phytopathologiques tunisiennes.**—[Phytopathological notes from Tunis.]—*Bull. Soc. Hist. nat. Afr. N.*, xxvi, 2, pp. 26–41, 4 pl., 5 figs., 1935.

Urophlyctis leproides [*R.A.M.*, xii, p. 537] is commonly present on beets at the French Colonial Agricultural School, Tunis, but causes very little damage. Its life-history appears closely to resemble that of *U. alfalfae* [ibid., xii, p. 177]. In addition to tumours on the crown of the beets, it also produces galls, often in large numbers, on the blade and main veins of the leaves. The fungus is found on wild *Beta vulgaris* remote from cultivated areas, on which it is apparently indigenous in Tunis.

Notes are also given on barley leaf blotch (*Marssonia graminicola*) [*Rhynchosporium secalis*: ibid., xiv, p. 15] and leaf spot (*Helminthosporium teres*) [ibid., xiv, p. 299], wheat brown neck [ibid., viii, p. 637], broad bean (*Vicia faba*) mosaic [ibid., xiv, p. 4], date palm (*Phoenix dactylifera*) heart rot (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) [ibid., xii, p. 302; xiii, p. 92], *Diplodia phoenicum* [ibid., xi, p. 571] on *P. canariensis*, *Septoria pistacina* on pistachio nut (*Pistacia vera*) leaves [ibid., vi, p. 627; viii, p. 339], *Gloeosporium fructigenum* [*Glomerella cingulata*] on almond fruits (stated to be the first record on green almonds), and *Polystigma ochraceum* on almond leaves [ibid., vi, p. 81].

Infection of date palms by *C. paradoxa*, a well-known trouble in Tunis, is followed by arrested development; the fully grown leaves persist, but no new ones are formed, the heart tissues being killed. If the terminal bud rots completely, the tree dies; if only partially, it grows for a time horizontally and then resumes its perpendicular habit.

On pistachio leaves *S. pistacina* produces dark brown, round or angular spots, 0·5 to 1 mm. in diameter, visible on both sides of the leaf, and sometimes covering at least half its surface; a whitish, translucent cirrhus of stylospores emerges from a pycnidium in the centre of each spot. The growth of affected trees is often arrested. Trees that showed severe infection early in May became completely defoliated by the beginning of August; the leaves lost colour, turned yellow, and finally fell, leaving the stalk adhering to the branch. Later, new leaves appeared on some of the trees. In southern Tunis the disease is endemic, and occasionally dangerous.

MAGROU (J.). **Réactions d'immunité des plantes vis-à-vis du Bacterium tumefaciens.** [Immunity reactions in plants in respect of *Bacterium tumefaciens*.]—*C. R. Acad. Sci., Paris*, cc, 3, pp. 257–259, 1935.

Agglutination was produced in aqueous suspensions of *Bacterium tumefaciens* in 9 cases out of 11 by the juice of a tumour on *Pelargonium zonale* at dilutions up to 1 in 1,000, and in 4 out of 6 by that of diseased *Chrysanthemum frutescens* juice (up to 1 in 10,000) [*R.A.M.*, xiii, pp. 151, 152]. Agglutination was most intense at the maximum concentrations, contrary to what was found in a test with the juice of healthy plants, in which the climax was reached in 11 out of 13 cases at a certain optimum and there was no agglutination at the maximum concentrations. In 3 cases out of 4 the juice of a healthy portion of a gall-bearing branch agglutinated the bacterial suspensions similarly to that from the infected areas. The agglutinating property was lost after 15 minutes' heating at 100° C. but maintained after half-an-hour at 80°.

Phytopathogenic bacteria other than *Bact. tumefaciens* were not agglutinated by the juices from diseased or healthy tissues of the experimental plants, while the crown gall agent from the above-mentioned tumours failed to respond by agglutination to the juice from crown galls on beetroot.

Precipitation immediately followed the introduction of juice from *C. frutescens* tumours into extracts, not only of *Bact. tumefaciens*, but also of *Bact. malvacearum*, *Bact. flaccumfaciens*, *Bact. mori*, and *Bacillus carotovorus*. The character for precipitation was found to be restricted to the diseased tissues and to the healthy portions of gall-bearing branches.

STAHEL (G.). **De krullotenziekte in Brazilië.** [The witches' broom disease in Brazil.]—*Ind. Mercuur*, lviii, 6, p. 71, 1935.

The witches' broom disease of cacao [*Marasmius perniciosus*] is stated to have been first detected forty years ago in the Saramacca district of Surinam [*R.A.M.*, xiv, p. 224], whence it spread within the next five years to all the chief plantations. Passing westward, it reached Demerara in 1906, but not until 1928 was it first observed on the east coast of Trinidad [ibid., viii, p. 160]. It is probable that the cacao plantations of the Orinoco delta, half-way between Demerara and Trinidad, and those of Carupano, opposite the latter on the mainland, were already infected at this period, but accurate information from these regions is wanting. The destructive outbreak in Ecuador, first reported in 1922 [ibid., xiii, p. 359], is due to a strain of the fungus possibly originating in the upper reaches of the Amazon and differing markedly from those in Surinam and Trinidad; the writer believes that this strain must have been conveyed by spores over the Andes from the wild cacao in that region. In 1920 and 1926 two cacao groves extensively infected by *M. perniciosus* were found well in the interior of Surinam, one in the upper Coppename region and the other along the upper Kutari some 20 km. from the Brazilian frontier [ibid., xiv, p. 155]. Cacao branches sent to the writer by J. R. Weir from the river Tapajoz, a tributary of the Amazon, bore witches' brooms up to 40 cm. in length, and the disease is reported to be prevalent throughout the Amazon valley. *M. perni-*

ciosus is now definitely known to be present in all the principal cacao-growing regions of South America apart from Venezuela (the eastern part of which is probably infected) and Bahia.

LATHBURY (R. J.). **Report of the Acting Senior Plant Breeder.**—*Rep. Dep. Agric. Kenya, 1933*, pp. 182–200, 1934.

Seedling inoculation tests carried out in Kenya showed that the South American Sabanero wheat variety was resistant to all four local physiologic forms of stem [black] rust [*Puccinia graminis tritici*: see above, p. 427]. It grew well, especially under poor, dry conditions, and owing to its resistance to black rust it is recommended for all areas in Kenya except those at the highest altitudes, where it is too susceptible to yellow rust [*P. glumarum*].

The advance previously reported [*R.A.M.*, xiii, p. 222] in the production of rust-resistant varieties at Njoro was maintained, a number of new strains being issued to farmers. An artificial epidemic of all the four forms of black rust [ibid., xiv, p. 226] enabled the hybrid wheat varieties grown at Njoro to undergo a very severe test, in which a number of strains proved to be highly resistant.

The wheat hybrids produced at the Scott Agricultural Laboratories all being susceptible to the recently discovered physiologic form K4 of black rust, a fresh series of nineteen crosses was made, in which Nos. K 2, R 5 (L 2), and UX 9 MIA 9 D, Sabanero, and Reliance were used as the resistant parents. Form K4 was not confined to the lower altitudes, as was at first hoped. Little difficulty was experienced in the breeding work in transmitting resistance to forms K1, K3, and K4, but the transmission of resistance to form K2, is a more complex problem.

Maize breeding work at Trans Nzoia is chiefly directed to producing types resistant to *Helminthosporium turcicum* and *Fusarium* rots [ibid., xii, p. 222]. In the 1933 experiments the plants were awarded marks from 0 (complete susceptibility) to 10 (complete resistance) for their characters in relation to resistance to *H. turcicum*, maize rust (*P. maydis*), and *Fusarium* spp. As in 1932, high marks were obtained for resistance to the first two by some lines, but only a few were very resistant to the *Fusarium* rots.

VANDERWALLE (R.). **Contribution à l'étude de la désinfection des céréales par l'eau chaude.** [A contribution to the study of cereal hot-water treatment.]—*Bull. Inst. agron. Gembloux*, iv, 1, pp. 3–21, 3 figs., 11 graphs, 1935. [Flemish, German, and English summaries.]

Investigations into the effect of hot-water treatments for the disinfection of cereal seed-grain [cf. *R.A.M.*, xiii, p. 750] showed that no appreciable injury to wheat, oats, barley, or rye was caused at temperatures under 50° C. except after long exposure, whereas even short exposures to temperatures above this were injurious. Short exposures at high temperatures did not give comparable results with long exposures at low ones. With the wheat varieties tested, the darker the grain the more resistant it was to the injurious effects of heating. With all the cereals treated a sigmoid graph was obtained for the effect of the exposures on germinative power at a certain temperature. Injury

increased with the age of the seed and the reduction of germinative ability.

Johnston (C. O.) & Miller (E. C.). **Relation of leaf-rust infection to yield, growth, and water economy of two varieties of Wheat.**—*J. agric. Res.*, xlix, 11, pp. 955–981, 7 figs., 1934.

This is a full, tabulated account of the authors' studies from 1931 to 1933 on the effect of intensity and duration of infection with leaf [brown] rust (*Puccinia triticina*) on the yield, plant characters, and water economy of two spring wheats, namely, Pusa No. 4 (susceptible) and Warden (resistant), an abstract from which has already been noticed [*R.A.M.*, xii, p. 427]. In the susceptible variety, rust reduced the yield in grain on the average by 42·4 to 93·8 per cent. (by weight) of that of the controls, the reduction increasing with the duration of the infection period, and being caused in the first place by the reduction of the number of grains formed in the ear and only secondarily by a reduction in the weight per grain [cf. ibid., xiii, p. 755]. While the yield of straw was not so heavily affected by the rust, it was reduced by more than one-third in the plants that were rusted from the seedling stage to maturity. Heavy infection resulted in a rapid and severe deterioration of the root system, independent of the time of infection, and characterized by discoloration, decrease in the number of fibrous roots, and marked loss in weight. Plants heavily rusted for long periods produced numerous new tillers at about the time when the grain of the primary culms began to mature. Infection with the rust also considerably retarded heading and prolonged the fruiting period.

In the resistant variety the rust resulted in a maximum reduction in yield of grain of 15·2 per cent. when the leaves were abundantly flecked, and only slightly affected all the other characters of the plants.

Hanna (W. F.). **The physiology of the fungi causing bunt of Wheat.**—*Proc. fifth Pacif. sci. Congr.*, pp. 3195–3204, 3 figs., 1 graph, [1934.]

A study of the conjugation of the sporidia of *Tilletia tritici* [*T. caries*] and *T. levis* [*T. foetens*] showed that on a medium of P_H6 approximately the same percentage (50) of pairs of sporidia belonging to the same spore conjugated at 10°, 18°, and 20° C. When sporidia from two different spores were paired on a medium of P_H6, approximately 50 per cent. of the pairs conjugated. It is therefore assumed that the sporidia produced by the spores taken from the single bunt ball used were of two kinds occurring in approximately equal numbers.

In investigations into heterothallism in *T. caries* and *T. foetens* the sporidia from spores of the former from a single bunt ball were cultured separately before conjugation occurred; other cultures were similarly made from single secondary conidia of both organisms. In one experiment pure cultures were obtained in this way from all the fourteen sporidia of one chlamydospore. Kota and Reward wheat seedlings were inoculated by inserting mycelium from a single culture or pairs of cultures into an incision made near the base of the plumule; after inoculation they were kept for about 12 days at 10°C. and then transferred to pots in the greenhouse. The plants inoculated with the mycelium of a a single culture of either fungus, whether the mycelium was derived from

a single sporidium or a single secondary conidium showed no infection, whereas those inoculated with certain pairs of mycelia produced bunted heads. The successful inoculations were made with pairs of mycelia from single sporidia, with pairs from single secondary conidia, or with mycelium from a sporidium and from a secondary conidium.

When crosses were made between *T. caries* and *T. foetens* by inoculating Kota and Reward seedlings with pairs of mycelia, the hybrid bunt balls were like those of the *T. foetens* parent, and the spores were smooth and contained trimethylamine [*R.A.M.*, xii, p. 277]. In the author's inoculation experiments definite proof has so far been obtained of the existence of only two sexual groups for the mycelia of *T. caries* and *T. foetens* [ibid., xi, p. 440].

The secondary conidia of both species were found to be uninucleate, as were those of *Entyloma menispermi*, *E. lobeliae*, and *E. linariae*; inoculation experiments and cytological observations when taken in conjunction appeared to show conclusively that the secondary conidia of *T. caries* and *T. foetens* are haploid.

FELLOWS (H.) & FICKE (C. H.). **Effects on Wheat plants of Ophiobolus graminis at different levels in the soil.**—*J. agric. Res.*, xlix, 10, pp. 871–880, 5 figs., 1934.

The results of experiments from 1925 to 1928 at Manhattan, Kansas, showed that *Ophiobolus graminis* [*R.A.M.*, xiv, pp. 157, 229] occurred throughout the upper layers and down to a depth of at least 15 in., in naturally infected soils. Artificial soil inoculations in pots and in the field indicated that serious injury to wheat (Kanred) plants only resulted when the inoculum was placed at a depth of 3 in. or less below the seed. The fungus reached the crowns either through the primary roots and sub-crown internodes or through the secondary roots, or both, severe infection of the hosts resulting from abundant invasion of the crowns, and usually terminating in the death of the plants. When only few roots were attacked, additional secondary roots were formed, and the plants survived and yielded fairly well. Various intergradations between these two extreme cases were observed. There was also evidence that *O. graminis* grows in the roots farther upwards than downwards.

MEYER-HERMANN (K.). **Beobachtungen über das Vergilben der Wintergerstensaat.** [Observations on the yellowing of the winter sown Barley.]—*Dtsch. landw. Pr.*, lxii, 3, p. 27, 5 figs., 1935.

In connexion with a brief description of various forms of yellowing in winter barley in Germany, the writer states that good control of mildew (*Erysiphe graminis*) [*R.A.M.*, xiv, p. 26], one of the causes of the trouble, was incidentally obtained in a recent test with unoiled calcium cyanamide, applied primarily against bent grass [*Agrostis alba*], at the rate of 1 doppelzentner per hect. 'Pearl' calcium cyanamide at the rate of 2 doppelzentner per hect. also proved beneficial.

GRAHAM (T. W.). **Nuclear phenomena in Helminthosporium gramineum.**—*Phytopathology*, xxv, 2, pp. 284–286, 2 figs., 1935.

Cytological studies of various growth stages of stained and fixed material of *Helminthosporium gramineum* [*R.A.M.*, xiv, p. 353], using

both mycelium from artificial culture and preparations from infected [barley] seed coats, endosperms, diseased seedlings before emergence of the young leaves from the coleoptile, and mature diseased leaves, showed the hyphal cells to be almost uniformly multinucleate, as also were the macro- and microconidia (1 to 13, usually 4 to 7 nuclei), and germ-tubes. Several nuclei were found to be already present in very young spores, so that the organism may even at this stage be truly heterocaryotic. Fusion of conidia, germ-tubes, and hyphal cells is of frequent occurrence, the nuclei apparently passing through the fusion tubes from cell to cell. Strong evidence is stated to be forthcoming that variation and physiologic specialization in *H. gramineum* may be at least partially explained by heterocaryosis.

Titus (H. W.) & Godfrey (A. B.). **Comparison of scabbed Barley, normal Barley, and Yellow Corn in diets for laying Chickens.**—*Tech. Bull. U.S. Dep. Agric.* 435, 9 pp., 3 graphs, 1934. [Received May, 1935.]

Comparative tests of the relative value of normal barley, barley affected with scab [*Gibberella saubinetii*], and yellow maize in diets for laying chickens showed that while the maize diets were the most efficient, barley with any degree of scab from moderate to very severe infection gave the same results as normal barley as regards maintenance of live weight and amount and economy of egg-production [cf. *R.A.M.*, xiv, p. 231].

Smith (D. C.). **Correlated inheritance in Oats of reaction to diseases and other characters.**—*Tech. Bull. Minn. agric. Exp. Sta.* 102, 38 pp., 11 figs., 1934. [Received May, 1935.]

Studies on the inheritance of reaction to *Puccinia graminis* in the cross of Gopher (moderately resistant to forms 1, 2, 5, and 9 and susceptible to forms 3, 4, 6, and 7) × Rainbow (resistant to all these forms) oats in Minnesota [cf. *R.A.M.*, xiii, p. 363] indicated that resistance and susceptibility to physiologic forms 1, 2, 3, 5, and 7 depended on a single, similar factor pair. Resistance to these forms was dominant in the progeny. The results obtained for segregation to forms 8 and 9 were inconclusive as regards the manner of inheritance, though the data indicated that the same factor pair influenced the reaction. No families resistant to forms 4 or 6 were obtained. These, together with the results of previous workers, indicate that a series of multiple allelomorphs controlling stem-rust reaction occur in oats. Resistance was inherited independently of lemma colour, length, strength or presence of awn, basal hairs, blast [ibid., xi, p. 363], culm diameter, or breaking strength of the straw. Seedling and adult plant reactions to forms 1, 2, 3, 5, and 7 agreed completely. Other factors than culm diameter and breaking strength were found to be important in resistance to lodging. Blast percentage in the F_3 families showed a significant positive correlation with lateness of heading.

Resistance to crown rust (*P. coronata*) [*P. lolii*: see next abstract] in crosses of Victoria with Double Cross II–22–220, Minrus, and Anthony was dominant or intermediate in the seedling stage and intermediate in adult plants; in some crosses resistance was associated with late maturity.

MURPHY (H. C.). **Physiologic specialization in Puccinia coronata avenae.**—*Tech. Bull. U.S. Dep. Agric.* 433, 48 pp., 1935.

This is a detailed and fully tabulated account of the author's continued investigations of specialization in *Puccinia coronata avenae* [*P. lolii*: *R.A.M.*, xi, p. 498; xiii, p. 434]. Using 11 [listed] oat varieties as standard differential hosts he determined the occurrence in North America from 1927 to 1932 of at least 33 physiologic forms of the rust. The reactions of these forms (to which standard numbers from 1 to 33 are assigned) on the differential varieties are briefly described, and a key for their identification is given. The forms differed not only in pathogenicity, but also in rapidity of the development of their teleuto stage, and some of them could be subdivided by the latter character. 'Restricted' (pathogenic to only a few of the differential varieties) forms tended to produce teleutospores more rapidly than the 'aggressive' (more widely pathogenic) forms, and usually teleutosori appeared on resistant varieties a few days earlier than on susceptible ones.

The reaction of the differential varieties, and of Victoria, Bond, and Markton, to form 1 was not greatly affected by the temperature (55°, 65°, 75°, or 85° F.) at which the plants were grown, but the effect of temperature on their reaction to form 7 was striking, this form being hardly distinguishable from form 1 at 85°; certain varieties were resistant at low and susceptible at high temperatures, and at intermediate temperatures they developed a mesothetic (X) [ibid., ii, p. 159] reaction. Forms 1, 3, and 7 were found each year, forms 1 and 7 being the most widely distributed and common. Observations indicated that these two forms, as well as some of the less important ones, overwinter on autumn-sown and volunteer oats in the winter oat regions, while other forms are apparently entirely dependent on the alternate host (*Rhamnus* spp.) for their perpetuation from year to year.

In tests of the seedling reaction of 266 [listed] oat varieties to forms 1, 3, 7, 16, 17, and 18, and of the adult reaction of these varieties to natural epidemics of crown rust at various localities in the central and southern parts of the United States, form 1 was the most aggressive, only 4 varieties, namely, Bond, Glabrota, Victoria (C.I. 2401), and Victoria (Scasso C.I. 2764), being resistant to it in the seedling stage. Bond and the two Victoria varieties alone proved to be resistant to all the 6 forms tested. There also was evidence that in adult plants the younger tissues appeared to be most susceptible and the older tissues most resistant.

Fourteen of the 33 physiologic forms were collected from naturally or artificially inoculated *Rhamnus* spp., including form 2 which is evidently heterozygous, since five additional forms were isolated from aecidia which developed when *Rhamnus* was inoculated with it. This would suggest that new forms may originate by hybridization and segregation on the aecidial host. Certain of the species of *Rhamnus* showed a tendency to harbour specific forms of the rust.

Of the 70 species of Gramineae which were tested, only *Achyrodes aureum* [*Lamarkia aurea*], *Anthoxanthum odoratum*, *Dactylis glomerata*, *Festuca octoflora*, *Phleum pratense*, *Poa annua*, and 14 species of *Avena* developed uredosori when inoculated with one or more of the six physiologic forms used.

Hubbard (V. C.) & Stanton (T. R.). **Influence of smut infection on plant vigor and other characters in smut-resistant Oat varieties.**—*J. agric. Res.*, xlix, 10, pp. 903–908, 1934.

A brief account is given of experiments from 1930 to 1932, inclusive, at Mandan, North Dakota, to test the effect of infection with covered smut (*Ustilago levis*) [*U. kolleri*] on the plant vigour and yield of smut-resistant oat varieties (Black Mesdag, Markton, and Navarro), as compared to that in the susceptible Victory variety [*R.A.M.*, xiii, p. 761]. The results showed that the resistant and susceptible varieties grown from dehulled inoculated seeds [ibid., x, p. 178] were adversely affected in their yield per row, the number of plants, panicles, and culms per row, and height, even though no sporulation of the fungus occurred on the resistant oats. There was some indication that the reduction in yield may have been due chiefly to a reduced number of plants in the inoculated rows, and to the presence of the latent infection. Smut infection tends to delay the first heading of both resistant and susceptible varieties.

The fact that in early and medium sowings the average yield was greater than that of late sowing, and that the average yield of the non-inoculated rows was in every case greater than that of the inoculated would suggest that the latent infection reached its greatest development in the late sowings. The rate of plant mortality increased progressively with the later date of sowing.

Rădulescu (E.). **Untersuchungen über die physiologische Spezialisierung des Haferflugbrandes (Ustilago avenae [Pers.] Jens.).** [Studies on physiological specialization in loose smut of Oats (*Ustilago avenae* [Pers.] Jens.).]—*Pflanzenbau*, xi, 8, pp. 295–300, 1935.

Thirteen collections of loose smut of oats (*Ustilago avenae*) from various parts of Rumania were tested for their pathogenicity towards eight standard varieties, of which Columbus, Kelsall's (Australian), and Pflugs and v. Lochows Yellow proved especially useful in separating physiologic forms of the fungus [*R.A.M.*, xiii, p. 231]. The collections were found to comprise four physiologic forms of which (1) is the least virulent, causing appreciable infection only on Fulghum and Laza; (2) attacks Pflugs Yellow, Laza, and Fulghum with fair to considerable severity, while v. Lochows, Columbus, and Kelsall's are relatively resistant; (3) causes heavy damage to Kelsall's, Pflugs, and Fulghum, Laza being moderately susceptible, and Columbus immune; while (4), the most widespread and virulent of the forms, produced a fair to intense degree of infection on all the test varieties except Black Mesdag and Red Rustproof, which were also immune from the three foregoing.

Johnson (I. J.) & Christensen (J. J.). **Relation between number, size, and location of smut infections to reduction in yield of Corn.**—*Phytopathology*, xxv, 2, pp. 223–233, 1935.

A tabulated account is given of the writers' studies in 1933–4, involving over 1,800 paired comparisons between diseased and healthy plants, on the correlation between the number, size, and position of maize smut (*Ustilago zeae*) infections and reduction of yield [*R.A.M.*, xiv, p. 354].

Both single and multiple galls were about twice as destructive on the main stalk and neck above the ear as those of similar size and number below the ear, usually on shoots or suckers. Other things being equal the losses from multiple galls were nearly directly proportional to the number of the galls on the plant, except that two large galls give almost 100 per cent. loss. Large galls above the ear habitually, and medium-sized single or multiple ones in the same site frequently, caused barrenness of the stalks. During 1932–3 some 0·7 per cent. of smutted plants in all the varieties and crosses grown at University Farm, St. Paul, Minnesota, were prematurely killed by the disease. Smut galls on the tip of the ear caused a smaller loss than those of similar dimensions but more uniform distribution over the ear. Heavy losses were caused by medium-sized and large smut galls on the tassels. Ears from smutted plants tended to produce less lustrous kernels than those from healthy ones, and were further more liable to contract ear rots [*Diplodia zeae*, *Gibberella moniliformis*, *G. saubinetii*, and other fungi: ibid., xiv, p. 232 *et passim*].

Stevens (N. E.) & Wood (Jessie I.). **Losses from Corn ear rots in the United States.**—*Phytopathology*, xxv, 2, pp. 281–283, 1 graph, 1935.

Attention is drawn to the close correspondence between two curves representing estimates of the losses from maize ear rots [*Diplodia zeae*, *Gibberella moniliformis*, *G. saubinetii*, and other fungi: see preceding abstract] between 1922 and 1933, one based exclusively on field observations and the other on inspections at terminal markets [cf. *R.A.M.*, xiii, p. 316]. Both show a low point in 1924, followed in 1926 by the heaviest losses of the period, and relatively much smaller damage in the last four years with another drop in 1931. The most marked disparity between the curves appears in 1928, when the field estimate was 25 per cent. and under 5 per cent. loss was actually registered at the official inspections.

Voorhees (R. K.). **Histological studies of a seedling disease of Corn caused by Gibberella moniliformis.**—*J. agric. Res.*, xlix, 11, pp. 1009–1015, 10 pl., 1934.

Continuing his investigations of the disease of maize in Florida caused by *Gibberella moniliformis* [*R.A.M.*, xii, p. 564], the author states that on maize seedlings artificially inoculated in the greenhouse the symptoms are a yellowing of the leaves, retardation in growth, dark brown lesions on the mesocotyls and roots, and in severe cases, a more or less complete drying of the leaves and death of the seedling. The fungus was shown to enter the plumule at its emergence from the coleoptile, the mesocotyl either by direct penetration of the epidermis or through ruptures in the cortex caused by the emergence of adventitious roots, and directly through the coleoptile. The first symptoms of infection in the germinating grain usually appear at the distal end of the coleorhiza and primary radicle, the latter being usually entered through ruptures in the cortex where lateral roots emerge. The cotyledonary plate region may be invaded through the opening produced by the stem bud breaking through the pericarp or by emergence of the coleorhiza, the fungus in

either case advancing into the scutellum and endosperm. There was evidence that the endodermis surrounding the stele in the mesocotyl and primary radicle acts as a barrier to the penetration of the hyphae, its efficacy depending on the degree of suberization.

ALLEN (RUTH F.). **A cytological study of heterothallism in Puccinia sorghi.**—*J. agric. Res.*, xlix, 12, pp. 1047–1068, 7 pl., 2 figs., 1934.

This is a full report of the author's cytological studies of heterothallism in *Puccinia sorghi* [*P. maydis*], an abstract from which has already been noticed [*R.A.M.*, xiii, p. 226]. In artificial inoculations on *Oxalis corniculata* var. *atropurpurea* the sporidial germ-tube enters the leaf through an epidermal cell; the resulting haploid mycelium produces numerous spermogonia on both leaf surfaces, and very small, short-lived, haploid aecidia are formed in abundance near the lower epidermis but deteriorate without forming spores. Stomatal hyphae are produced, chiefly in close proximity to spermogonia and aecidia. Fertile aecidia are only produced after fertilization. The spermogonia remain active for a considerable period, producing spermatia and replacing old paraphyses by new ones. Both the small haploid aecidia and the stomatal hyphae are short-lived, but new ones keep forming. Fertilization is brought about by anastomoses between two mycelia in the leaf and has also been effected by transfer of spermatia of one sex to an infection of opposite sex, a process which can happen in several ways in nature. Fertilization can take place in infections ten days old or at any time afterwards so long as the mycelium remains alive, and is equally effective whether the spermatia reach the upper or the lower surface of the infection. Twenty-four hours after the entrance of the spermatia into the haploid mycelium [loc. cit.], 60 per cent. of the mycelial cells contain more than one nucleus, this rapid diploidization being achieved, in the main, by rapid divisions and migrations of the introduced nuclei. Fertile aecidia open six days after spermatization, and start liberating spores.

RODENHISER (H. A.). **Studies on the possible origin of physiologic forms of Sphacelotheca sorghi and S. cruenta.**—*J. agric. Res.*, xlix, 12, pp. 1069–1086, 1 col. pl., 6 fig., 1 diag., 1 graph, 1934.

Continuing his studies of the problem of hybridization in *Sphacelotheca sorghi* and *S. cruenta* [*R.A.M.*, xii, p. 89] the author gives details of experiments in which he paired in all possible combinations single sporidial lines isolated from promycelia of chlamydospores of physiologic forms 1, 2, and 3 of *S. sorghi* [ibid., xi, p. 448], form 1 of *S. cruenta* [ibid., xiii, p. 227], and from F_1 intra- and interspecific hybrids of the two smuts. Fusions between the paired uninucleate sporidia occurred readily in every case, giving rise to diploid hyphae which were shown by their subsequent behaviour when inoculated into the host to contain hereditary factors of the two parental lines (e.g., factors governing the sex of sporidia, the general morphology of the smut sori, the colour of the peridia, and the degree to which host plants may be stunted, all of which were inherited independently of each other). When tested on Reed kafir sorghum (which is susceptible to all known collections of the two smuts) the intraspecific hybrids were more and the interspecific

hybrids less virulent than the parent lines; on the varieties susceptible to one parent and resistant to the other, both intra- and interspecific smut hybrids were intermediate in virulence. These results appear to support the suggestion advanced by Tisdale, Melchers, and Clemmer that their Milo and Feterita sorghum smut strains may be hybrids of *S. sorghi* and *S. cruenta* [ibid., vi, p. 664].

While nothing is yet known concerning the chromosomes in *S. sorghi* and *S. cruenta* and comparatively little of their genetics, the fact that their sporidia readily fuse together in culture may possibly be an indication of their close taxonomic relationship. On the other hand, the fact that the majority of promycelia from F_1 chlamydospores obtained from the fusion of the second sporidium of form 1 of *S. sorghi* with the corresponding sporidium of *S. cruenta*, produced, instead of sporidia, peg-like structures which failed to develop either sporidia or hyphal threads, is considered to indicate genetic sterility and, consequently, supports the view that *S. sorghi* and *S. cruenta* are distinct species.

ISENBECK (K.). **Untersuchungen über die Physiologie von Sphacelotheca sorghi, den gedeckten Körnerbrand von Sorghum.** [Investigations on the physiology of *Sphacelotheca sorghi*, the covered grain smut of Sorghum.]—*Phytopath. Z.*, viii, 2, pp. 165–182, 5 figs., 1935.

A tabulated account is given of the writer's studies at University Farm, St. Paul, Minnesota, on monospore cultures of *Sphacelotheca sorghi* from sorghum [*R.A.M.*, xiii, p. 436] in various parts of the United States and from Sudan grass [*Andropogon sorghum* var. *sudanensis*] in the experimental garden, St. Paul.

The optimum temperature for seedling infection by *S. sorghi* was found to be 25° C. [ibid., ii, p. 12; iv, p. 158]. The fungus showed little tendency towards heterothallic fusion in culture [see preceding abstract], but there were other indications of multipolar sexuality (a number of sexual groups) as found by Bauch in *Ustilago zeae* [ibid., xii, p. 88]. Certain combinations of monosporidial lines from a single promycelium proved pathogenic in groups suggesting the presence of two sex groups only, but combinations between monosporidial lines from different smut spores revealed the existence of a larger number. Pronounced variations in nearly all characters were shown by the different monosporidial lines in culture, particularly striking being the divergences of colour and the occurrence of sectoring. Twelve sporidial 'batches' (a 'batch' being the four sporidia of a promycelium) of two monosporidial lines, one black and the other yellowish-brown, were studied from the standpoint of colour inheritance. Three colours developed in the progeny—black, intermediate, and yellowish-brown—in the following segregation ratios: 2:2:0, 2:0:2, 1:2:1, 1:1:2, 0:1:3, and 0:0:4.

MITRA (M.) & MEHTA (P. R.). **Diseases of Eleusine coracana Gaertn. and E. aegyptiaca Desf. caused by species of Helminthosporium.**—*Indian J. agric. Sci.*, iv, 6, pp. 943–975, 4 pl. (1 col.), 7 graphs, 1934. [Received April, 1935.]

This is a full report of the authors' morphological, cultural, and pathogenicity studies of *Helminthosporium nodulosum* which is stated

to be widespread and very destructive in India on *Eleusine coracana* and to have been isolated from *E. aegyptiaca* at Pusa, and of a strain of *H. leucostylum* (termed *C.*) which was found causing a much less severe disease of *E. coracana* in Pusa [*R.A.M.*, xiii, pp. 77, 159; xiv, p. 161]. Besides seedling blight, leaf spots, and head blight which are caused by both organisms, *H. nodulosum* causes foot and root rot and attacks the floral parts, especially in wet weather, penetrating the young grains and checking their development. The various symptoms of attack are described in some detail.

Inoculation experiments indicated that all the organs of the hosts may be attacked by both organisms, seedlings being apparently more susceptible to *H. nodulosum.* This species can infect the aerial parts of *E. coracana* within a temperature range from 10° to 37·5° C. with an optimum between 30° and 32°. It infects the leaves more readily from the upper surface or between the leaf and the leaf sheath, and enters through the stomata, epidermal cells, or more frequently through certain epidermal outgrowths. Cross-inoculation experiments showed that both species have a wide host range, including maize, sorghum, *Pennisetum typhoideum,* and *Panicum frumentaceum. H. nodulosum* caused small spots on sugar-cane, which was not infected by *H. leucostylum.*

Studies in pure cultures showed that the macroscopic (aerial mycelium, colour, and zonation) and microscopic (sporulation, shape, size, and septation of conidia and conidiophores, formation of chlamydospores and secondary spores) growth features of *H. nodulosum* and *H. leucostylum* are affected by environmental conditions such as light and darkness, temperature, humidity of air and media, and the like. The growth rate of both species varied with the nature of the medium used, and that of *H. nodulosum* also with some other factors such as the amount of medium and humidity. The *C.* strain of *H. leucostylum* was shown to be a comparatively slow growing fungus, differing from Drechsler's type species in its conidiophores, which are conspicuously slender at the basal part, gradually becoming broader at the flat or anvil-shaped top, and in its olive-brown conidia, with 1 to 6 septa, measuring 18 to 78 by 10 to 12 μ, while those of *H. leucostylum* type are deep olivaceous, with 1 to 8 septa, and measure 15 to 67 by 11 to 17 μ.

DAVIES (R.). **Fungal invasion of navel Oranges.**—*Rep. Low Temp. Res. Lab., Capetown, 1933,* pp. 114–120, 1 graph, 1935.

By using the method of Gregory and Horne [*R.A.M.*, vii, p. 586] the author studied the course of invasion of navel oranges in 1932 and 1933 from different localities in South Africa (approximately 100 fruit from each) by *Penicillium digitatum* [ibid., xii, p. 167; xiv, p. 96]. The results obtained [which are tabulated and discussed] showed that resistance varied much more from season to season than from district to district in either season. The evidence also indicated that there may be a gross correlation between resistance and the amount of wastage occurring in export fruit, presupposing (as is likely) that the degree of resistance to wastage is correlated with the degree of resistance to mechanical injury. The mean rate of invasion per day for fruit picked early in the season in one area was 0·399 ($\pm$0·0110) cm., while that for the fruit picked late in the same locality was 0·323 ($\pm$0·0076). The differ-

ence in these rates is regarded as significant; if a definite relationship is established between resistance to infection and susceptibility to mechanical injury, the bearing of these results on the relationship of insect injuries to the inherent qualities of the fruit will require investigation.

'Wilting' the fruit for a period of 5 days before inoculation lowered the resistance to fungal invasion, while wilting for 10 days before had very little effect; the storage of non- and 5 days-wilted fruit for 3 or 6 weeks prior to inoculation also lowered resistance.

High resistance was associated with a low moisture content of pulp and rind, high total soluble solids and titratable acid in the juice, and with high ash, potash, calcium, magnesium, and phosphorus content.

Beyers (E.). **Comparison of Klotz's vitality test for Lemons with invasion by Penicillium digitatum as a means of determining the susceptibility of Oranges to wastage.**—*Rep. Low Temp. Res. Lab., Capetown, 1933*, pp. 120–122, 1935.

A comparison was made of the author's method of testing the susceptibility of Washington navel oranges to infection by *Penicillium digitatum* [see preceding abstract] (random samples being pre-cooled for two days at 40° F., inoculated by a hypodermic syringe with about 1 c.c. of spore suspension of the fungus into the inner rind bordering the flesh at the side of the orange, dipped in alcohol, drained, wrapped, packed, and stored for about 30 days at 40°) with Klotz's rapid method for testing the storage life of lemons (based on the time-rate of reduction of a permanganate solution by the materials exosmosing from the fruit into water). The resulting two sets of [tabulated] data were compared statistically and showed that under the experimental conditions there was no relationship between the time of colour reduction in Klotz's test and the diameter of infection area in the author's method. This is attributed to the impossibility in practice of finding a completely uninjured rind in fruits subjected to ordinary handling; minute wounds in the outer rind may permit considerable exosmosis of reducing substances and so give a very low figure in the vitality test, although the fruit may in fact be highly resistant.

Camp (A. F.). **Zinc sulfate as a soil amendment in Citrus groves.**—*Proc. Fla hort. Soc., 1934*, pp. 33–38, 1934. [Abs. in *Chem. Abstr.*, xxix, 8, p. 2642, 1935.]

Zinc sulphate (89 per cent.), applied in March and June at the rate 0·25 to 2 lb. per tree to badly frenched seven-year-old Satsuma oranges [*Citrus nobilis* var. *unshiu*] at Gainesville, Florida [*R.A.M.*, vii, p. 441], caused a marked and rapid improvement [cf. ibid., xiv, pp. 176, 302]. A similar treatment was ineffectual, however, in the case of mild frenching of orange and grapefruit trees in other parts of the State. The condition of severely frenched Pineapple oranges was ameliorated by the application of zinc sulphate to the soil at the rate of 10 to 15 lb. per tree, while a very pronounced improvement was obtained by spraying the leaves of such trees with a solution of 5 lb. zinc sulphate and 5 lb. lime in 50 galls. water. Definite, though somewhat less striking results have also been secured by similar treatments on Valencia oranges.

Bahrt (G. M.). **Soil fertility and bronzing of Citrus.**—*Proc. Fla hort. Soc., 1934*, pp. 18–20, 1934. [Abs. in *Chem. Abstr.*, xxix, 8, p. 2647, 1935.]

Bronzing of citrus trees in the more advanced stages is characterized by a profusion of dead wood, falling leaves, reduction in new growth, decrease in fruit yield, and a marked change in the colour of many of the leaves from green to deep yellow. The addition to a complete fertilizer of ground or dolomitic limestone, magnesium sulphate (0·125 to 0·625 lb. per tree), or ground limestone plus magnesium sulphate (2 to 6 lb.) resulted in early indications of improvement. In a few cases the application of extra quantities of superphosphate, potassium sulphate, and calcium sulphate ameliorated the condition of the trees. The soil to a depth of 18 in. below bronzed trees was found to be almost uniformly lower in total and nitrate nitrogen, calcium oxide, and organic matter than that beneath normal ones.

King (C. J.), Eaton (E. D.), & Hope (C.). **Catalase activity in relation to age and viability of sclerotia of the Cotton root-rot fungus.**—*J. agric. Res.*, xlix, 10, pp. 897–902, 1 fig., 1934.

After a brief reference to observations which showed that the gradual darkening of colour which occurs with age in the sclerotia of *Phymatotrichum omnivorum* [*R.A.M.*, xiv, p. 360] is not a reliable indicator of the age or vigour of these bodies, the author gives a few details of experiments which indicated that the catalase activity of the macerated tissues of the sclerotia as a rule declined with age. A great or abrupt reduction in this activity, however, only occurred in sclerotia beginning to lose germination power, and there was a suggestion that an after-ripening process, comparable to that in certain seeds, takes place in the sclerotia, during which the catalase activity reaches its maximum. This activity appeared to be closely related to the metabolic condition of sclerotial tissues, and might serve as an indicator of their age, and as a test for varying degrees of vigour or of death. It was further shown that catalase activity rapidly declines when the sclerotia are dried.

Jordan (H. V.), Dawson (P. R.), Skinner (J. J.), & Hunter (J. H.). **The relation of fertilizers to the control of Cotton root rot in Texas.**—*Tech. Bull. U.S. Dep. Agric.* 426, 76 pp., 35 figs., 2 maps, 1934. [Received May, 1935.]

Investigations [which are fully described] into the relation of soil fertility and the use of fertilizers to the control of cotton root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xiii, pp. 632, 633, 698] in Texas showed that the acceleration of maturity brought about by the fertilizers in most instances reduced the losses from the disease, while the increases in total yield were generally more than large enough to compensate for the cost of the treatment. Losses were significantly reduced where fertilizers effectively enhanced the vigour and yield of the plants, indicating that the continued use of appropriate fertilizers in conjunction with other measures to restore or maintain fertility may eventually effect a material amount of control, economically profitable even on soils where the increased yields are relatively low, and when

combined with rotation, fallowing, and other cultural measures, may even lead to the eradication of the disease in fields so treated.

KING (C. J.), HOPE (C.), & EATON (E. D.). **Some microbiological activities in manurial control of Cotton root rot.**—*J. agric. Res.*, xlix, 12, pp. 1093–1107, 3 figs., 1 diag., 1 graph, 1934.

In continuation of the investigation of the controlling effect of manuring on the cotton root rot disease (*Phymatotrichum omnivorum*) [see preceding abstract], the authors give an account of experiments in 1933 at Sacaton, Arizona, the results of which showed that, as determined by a slight modification of Cholodny's method of direct microscopic examination [see below, p. 469], bacteria, actinomycetes, and saprophytic fungi were more abundant in plots that had received organic manures for several years than in the alternating unmanured plots; *P. omnivorum* alone was more abundant in the unmanured plots. This would suggest that the dense population of organisms engaged in the decomposition of the organic materials developed a soil condition temporarily unfavourable for the growth and activity of the cotton root rot fungus. There was also some evidence of actual parasitism of the hyphae of *P. omnivorum* by certain of the other organisms.

EATON (E. D.) & KING (C. J.). **A study of the Cotton root-rot fungus (Phymatotrichum omnivorum) in the soil by the Cholodny method.**—*J. agric. Res.*, xlix, 12, pp. 1109–1113, 2 figs., 1 diag., 1934.

The main feature of this paper is a description of a special holder devised by the authors to maintain the glass slides used in Cholodny's method for the microscopic study of the soil microflora [see preceding abstract] at determined depths in the soil up to about 3 feet, for the special purpose of investigating the growth and development of the mycelium of *Phymatotrichum omnivorum* in the soil under natural field conditions. Preliminary observations indicated that the fungus was active in the soil at least six weeks before the appearance of the first symptoms of root rot on adjacent cotton plants; the growth of the mycelium in the soil did not appear to be connected with roots, as it developed in a clean fallow.

PETCH (T.). **Notes on entomogenous fungi.**—*Trans. Brit. mycol. Soc.*, xix, 3, pp. 161–194, 7 figs., 1935.

Besides the 11 species of *Cordyceps* which are discussed in this series of his notes on entomogenous fungi [*R.A.M.*, xiii, p. 161] the author describes *Stereocrea coccophila* n.sp. on a scale insect on *Eugenia* sp. in Ceylon; *Patellina epimyces* n.sp. parasitic on *Hirsutella versicolor* and *H. entomophila*; *H. formicarum* n.sp. (conidial stage of *Ophiocordyceps unilateralis*) in British Guiana and Ceylon; *H. radiata* n.sp. on flies in British Guiana; *Blastotrichum aranearum* n.sp. on spiders in Ceylon; *Verticillium fuliginosum* n.sp. on a leafhopper on sugar-cane in Surinam and Panama; *Sporotrichum columnare* n.sp. on *H.* spp. in the West Indies; and *Metarrhizium brunneum* n.sp. on a Homopterous insect (Cicadellidae) in the Philippine Islands. Notes are also given on *Entomophthora aprophorae*, and on *Aschersonia caespitica* which is stated

to be the imperfect stage of *Hypocrella amomi*, as well as on some other entomogenous fungi.

BARTLETT (K. A.) & LEFEBVRE (C. L.). **Field experiments with Beauveria bassiana (Bals.) Vuill., a fungus attacking the European Corn borer.**—*J. econ. Ent.*, xxvii, 6, pp. 1147–1157, 1934.

It is apparent from the results [which are fully described and tabulated] of large-scale field experiments conducted from 1930 to 1932 in Massachusetts in the control of the European corn borer (*Pyrausta nubilalis*) by inoculation with *Beauveria bassiana* [*R.A.M.*, xi, p. 299; cf. also xiv, p. 361] that the insect is readily susceptible to infection during the very early larval stage. An appreciable reduction in the incidence of larval survival may be effected by dusting fields of infested maize and weeds with a mixture of spores and flour in the proportion, e.g., of 10 gm. : 8 lb. The fungus has been found to be capable of overwintering in the field and re-establishing itself naturally on new larvae in the following season, but further investigations are necessary to determine its practical value as a spontaneous enemy of the corn borer.

LAMB (J. H.) & LAMB (MARGARET L.). **A grouping of the Monilias by fermentation and precipitin reactions.**—*J. infect. Dis.*, lvi, 1, pp. 8–20, 4 graphs, 1935.

On the basis of sugar fermentation and precipitin tests [which are fully described and the resulting data tabulated], three groups of yeast-like fungi of the *Monilia* type associated with various human ailments are differentiated, namely (1) *M.* [*Candida*] *albicans*, *M.* [*C.*] *psilosis*, and *M. candida* [*C. vulgaris*]; (2) *M.* [*C.*] *parapsilosis*; and (3) *M.* [*C.*] *krusei* [cf. *R.A.M.*, xiii, p. 636; xiv, p. 34].

WILE (U. J.). **Cutaneous torulosis.**—*Arch. Derm. Syph., N.Y.*, xxxi, 1, pp. 58–66, 4 figs., 1935.

Full clinical details are given of a fatal case of generalized torulosis, culminating in meningitis, in a 17-year-old boy [cf. *R.A.M.*, xiii, p. 236]. The causal fungus (*Torula* (?) *histolytica*), which was found in the glands of the neck, in the brain, and in cutaneous lesions (of a somewhat different type from those previously described), occurs in the shape of well-defined, double-contoured, yeast-like bodies. The condition is readily distinguishable from blastomycosis [cf. ibid., xiii, p. 162; xiv, p. 168] by the lack of abscess formation and by the immense numbers of organisms occurring and enclosed within giant cells throughout the infected regions, and from coccidioidal granuloma [*Coccidioides immitis*: see next abstracts] not only by the foregoing features but also by the absence of endosporulation.

CIFERRI (R.) & REDAELLI (P.). **Studii sul Coccidioides immitis Stiles. IV. Caratteristiche culturali, biochimiche, patogenetiche e micromorphologiche in vivo ed in vitro dei ceppi tipici.** [Studies on *Coccidioides immitis* Stiles. IV. Cultural, biochemical, pathogenic, and micromorphological characters of the type strains *in vivo* and *in vitro*.]—*Boll. Soc. ital. Biol. sper.*, ix, 9, pp. 961–962, 1934.

In further studies of *Coccidioides immitis* [*R.A.M.*, xiv, p. 362] the authors found that the following type strains, viz., *Blastomycoides*

immitis [ibid., x, p. 104], Moore's strain [ibid., xii, p. 170], Weidman's strains nos. 1136, 1091, 1676, 1978, da Fonseca's strain [ibid., vii, pp. 167, 719], and *Geotrichum louisianoideum* [ibid., xiii, p. 162] showed closely similar cultural, morphological, and biochemical characters [which are briefly discussed], while all produced fatal lesions in laboratory animals [ibid., xiii, p. 235]. Under parasitic conditions (i.e., in inoculated susceptible animals and naturally infected human beings) the hyphae undergo rapid lysis, while the chlamydospores, which function as hypnospores, swell and become plurinucleate; by a progressive cleavage of the protoplasm the endospores, which the authors regard as 'aplanetic' [non-motile] zoospores, become differentiated, being released by the rupture or partial lysis of the sporangium.

CIFERRI (R.) & REDAELLI (P.). **Studii sul Coccidioides immitis Stiles. V. Caratteristiche culturali, biochimiche, patogenetiche e micromorphologiche in vivo ed in vitro dei ceppi degradati.** [Studies on *Coccidioides immitis* Stiles. V. Cultural, biochemical, pathogenic, and micromorphological characters of the degenerate strains *in vivo* and *in vitro*.]—*Boll. Soc. ital. Biol. sper.*, ix, 9, pp. 963–964, 1934.

A study of the following degenerate strains of *Coccidioides immitis*, viz., *Geotrichum immite* (Castellani) Agostini, *Blastomycoides immitis* Castellani (Ciferri's strain), and *B. dermatitidis* Castellani [*R.A.M.*, xiii, p. 235], of which Agostini's and Ciferri's strains were derived from Castellani's, but had for some years been kept in culture under environmental conditions different from those of the parent, showed that the cultural, morphological, and biochemical characters were not different from those of the parent or any of the type strains previously investigated [see preceding abstract]; inoculations of laboratory animals, however, demonstrated that they had lost virulence, and the few zoosporangia which developed in the inoculated animals were smaller and contained only a few small zoospores. These strains more readily succumbed to the defensive action of the tissues than the original ones.

These changes may explain the existence of permanently degenerate strains in localities remote from the normal geographical source of *C. immitis* (California), which cause mild infections only. A case in point is that of *Glenospora meteuropaea* [*C. immitis* var. *meteuropaea*: ibid., xiv, p. 100] isolated from a comparatively mild human infection in Naples.

DE MONBREUN (W. A.). **The cultivation and cultural characteristics of Darling's Histoplasma capsulatum.**—*Amer. J. trop. Med.*, xiv, 2, pp. 93–125, 5 pl., 1 fig., 1934.

A fungus cultivated for the first time from a case of Darling's histoplasmosis [see next abstract] was experimentally proved by inoculation into monkeys (*M* [*acacus*] *rhesus*) to be the agent of the disease. It may be cultivated either in the (pathogenic) yeast-like form in which it occurs in the lesions or as a mycelium.

Although certain cultural characters of the organism (*Posadasia*) [*capsulata*] are suggestive of a relationship with the Endomycetales, the retention of the name *Histoplasma capsulatum* [*R.A.M.*, xiv, p. 235] is advocated pending further studies. It is recommended, moreover, that

the present clinical term 'histoplasmosis' be changed to 'cytomycosis' with a view to emphasizing the nature of the etiological agent and its connexion with the host cells.

DODD (KATHARINE) & TOMPKINS (EDNA H.). **A case of histoplasmosis of Darling in an infant.**—*Amer. J. trop. Med.*, xiv, 2, pp. 127–136, 2 pl., 1934.

Clinical details are given of a fatal case of Darling's histoplasmosis (*Histoplasma capsulatum*) [or *Posadasia capsulata*: see preceding and next abstracts] in a six-months-old white boy, a native of Tennessee, this being the first report of the disease in infancy and the third of its occurrence in North America. The diagnosis was made from the blood during life by the detection of the parasite in the large mononuclear cells. Many of the symptoms of the disease may be explicable by the action of the these cells in plugging the blood-vessels, destroying the alveoli of the lungs, massively invading the bone marrow, and eliminating the red cells.

CIFERRI (R.) & REDAELLI (P.). **Sulla posizione sistematica dell'agente patogeno del farcino equino.** [On the systematic position of the pathogenic agent of equine farcy.]—Reprinted from *Bol. Ist. sieroter. Milano*, fasc. 10, 8 pp., 1934. [German summary.]

This paper, in which the authors describe their comparative study of *Histoplasma capsulatum* [or *Posadasia capsulata*: see preceding abstracts], *Cryptococcus farcinimosus*, and *C. muris* and adduce their reasons for transferring the two last-named organisms to the genus *Histoplasma*, is an expanded version of one already noticed from another source [*R.A.M.*, xiv, p. 235].

ALLEN (F. R. W. K.). **Five cases of rhinosporidiosis, four in females.**—*Indian med. Gaz.*, lxx, 2, p. 76, 1935.

Clinical details are given of five cases of rhinosporidiosis examined at the Raipur Main Hospital, India, four of which were in females. *Rhinosporidium* [*seeberi*: *R.A.M.*, xiv, p. 100] was detected in the nasal tumours in each patient. It is considered probable that the spores of the fungus are inhaled during rice-husking and become lodged in abrasions of the nasal mucous membrane whence the tumour develops.

BRIEGER (F. G.). **Antirrhinum rust.**—*Gdnrs' Chron.*, xcvii, 2512, pp. 113–114, 1935.

Observations at the John Innes Horticultural Institute, Merton (Surrey), have shown that the wild species of *Antirrhinum*, *A. molle*, *A. glutinosum*, and others are susceptible to a varying extent to rust [*Puccinia antirrhini*: *R.A.M.*, xiv, p. 364], while hybrids between such species as *A. latifolium*, *A. hispanicum*, and *A. barrelieri* on the one hand and *A. majus* on the other contract heavy infection.

POEVERLEIN (H.). **Puccinia antirrhini Dietel et Holway, ein neuer Eindringling aus Nordamerika.** [*Puccinia antirrhini* Dietel et Holway, a new intruder from North America.]—*Ann. mycol., Berl.*, xxxiii, 1–2, pp. 104–107, 1935.

Attention is briefly drawn to the recent intrusion of the North

American *Puccinia antirrhini* [see preceding abstract] into France, England, Denmark, and Germany, with a list of twenty-six localities in the last-named country in which the rust has been found to date.

Storck (A.). **Ein Anbauversuch zur Welkekrankheit der Sommerastern.** [A cultivation experiment on the wilt disease of the Summer Aster.] —*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 7, p. 83; 8, pp. 93–94, 1935.

Either of two fungi may be responsible for the wilt disease that is threatening the summer aster [*Callistephus chinensis*] cultivation in Germany, *Fusarium oxysporum* f. 6 [*R.A.M.*, xii, p. 448; cf. ibid., xiv, p. 172] or *Verticillium albo-atrum* [ibid., vii, p. 9] predominating in different types of soil and climate but causing much the same external symptoms. The writer's trials at Berlin-Dahlem with a number of Californian, German, French, and Italian aster varieties were concerned primarily with the former organism, a high degree of susceptibility (round about 80 per cent.) to which was shown by two French strains of Herkules and the Italian Leuchtfeuer, followed by three more of Italian origin—dwarf chrysanthemum (62), American Bush (54), and Californian Giant (46), and the German Frankreich (43). A complete absence of infection was shown by Bodger's (California) Original China American Beauty, Crego, King, American Bush (U.S.A.), and Early-flowering Beauty, as well as by Ball's (Chicago) Improved Crego Giant Cattleya and Incomparable American Bush, only a trace by Ball's Early White, and under 5 per cent. by Bodger's Giant Peony, Washington, and Comet, and by Ball's Early King Peach-blossom and Heartblood.

Gante (T.). **Echter Mehltau auf Begonienblättern in Deutschland.** [True mildew on Begonia leaves in Germany.]—*NachrBl. dtsch. PflSchDienst*, xv, 2, pp. 14–15, 1935.

In November, 1934, Konkurrent begonia leaves were submitted to the Geisenheim (Rhine) Phytopathological Experiment Station showing brown spots, 0·5 cm. or more in diameter, covered with the whitish mycelium of *Oidium begoniae* Putt., hitherto reported, according to Pape, from America and Denmark [*R.A.M.*, xii, p. 448]. Perithecia being absent, no more exact determination of the fungus was possible.

Manil (P.). **Une maladie bactérienne du Lilas, nouvellement constatée en Belgique.** [A bacterial disease of Lilac newly recorded in Belgium.]—*Bull. Inst. agron. Gembloux*, iv, 1, pp. 90–91, 1935.

In May, 1934, the author received lilac specimens showing symptoms of bacterial blight on the leaves and branches from several localities in Belgium, a country where the disease had not previously been recorded. From affected material an organism was isolated which agreed with Bryan's description of *Bacterium* [*Pseudomonas*] *syringae* [*R.A.M.*, vii, p. 515; xiv, p. 319], and inoculations with this on healthy lilacs either by needle-pricks or aspersion gave positive results, the incubation period for the former method ranging from three to seven days. Inoculations of plums, apples, and pears with the same organism gave negative results.

HENDRICKX (L.). **Un nouvel hôte du Bacterium tumefaciens.** [A new host of *Bacterium tumefaciens.*]—*Bull. Inst. agron. Gembloux*, iv, 1, p. 90, 1935.

One month after the stem of a young rosette of *Sempervivum tectorum* had been inoculated by needle-prick with an American strain of *Bacterium tumefaciens* isolated from a gall on raspberry [*R.A.M.*, xiv, p. 288] a tumour developed at the site of inoculation, the characteristic arrangement of the leaves was destroyed, and the new leaves formed were larger and thicker than those on the controls; a general chlorosis set in, and the lower verticils became completely necrosed.

SMITH (C. O.). **Inoculations of Stagonospora curtisii on the Amaryllidaceae in California.**—*Phytopathology*, xxv, 2, pp. 262–268, 1 fig., 1935.

Positive results were given by inoculation experiments with *Stagonospora curtisii*, the agent of leaf scorch of *Narcissus* sp. and *Hippeastrum vittatum* hybrids in California [*R.A.M.*, xiii, p. 167], on the following additional Amaryllidaceae: *Amaryllis belladonna*, *Chlidanthus fragrans*, *Crinum powelli*, *Galanthus* sp., *Hymenocallis calathina*, *Leucojum vernum*, *Lycoris squamigera*, *Pancratium maritimum*, *Sternbergia lutea* [*S. citrina*], and *Zephyranthes candida*. The spores of the fungus (with which, among others, *Phyllosticta gemmipara* [ibid., viii, p. 649], *Phoma amaryllidis* [ibid., viii, p. 578], and *Stagonospora crini* [ibid., xiii, p. 772] are believed to be synonyms) are variable in shape and size (small and continuous or large and up to 5-septate), the former predominating in culture. They were found to be viable in dry herbarium material after one year.

SIBILIA (C.). **'Saltazioni' in Heterosporium gracile.** [Saltations in *Heterosporium gracile.*]—*Boll. Staz. Pat. veg. Roma*, N.S., xiv, 4, pp. 447–474, 14 figs., 1934. [English summary.]

From monoconidial cultures of *Heterosporium gracile* [the conidial stage of *Didymellina macrospora*: R.A.M., xi, p. 559], isolated from iris leaves in Italy, the author obtained many modifications and some saltations, including an albino, sterile strain, produced either as a sector or as a change in a whole monoconidial culture, which remained invariable for about two years. He also obtained a zonated, white and brown strain, unreversible in normal growing conditions, and many strains differentiated from the original culture in colour and zonation which, however, later reverted. When two of the strains were submitted to the action of radium, two saltations were produced which remained unchanged through many generations; when the same strains were exposed to ultra-violet rays, no sudden variations arose. Variations of temperature determined in the one strain the appearance of an albino, sterile form, and in the other, sectors resembling a strain obtained earlier. When zinc sulphate was added to the medium, the genetic equilibrium of the strains was profoundly modified, many saltant sectors being produced, some showing a dendritic type of growth. Tests with three of the strains, including the albino one, showed no modification in pathogenicity to iris.

BENNETT (F. T.). **Rhizoctonia disease of turf.**—*Gdnrs' Chron.*, xcvii, 2513, p. 129, 1 fig., 1935.

A comparison of a *Rhizoctonia* isolated from the small 'dollar spot' type of disease in lawn turf in northern, eastern, and southern England during the last two years with the species found by Monteith on similar patches in the Unites States [*R.A.M.*, v, p. 742; cf. also xiv, p. 240] showed the two to be identical. In the writer's opinion, the species concerned in the causation of the disease in either country is not *R. solani* but a hitherto undescribed species, which is provisionally named *R. monteithianum.* The mycelium of the fungus is thin, downy, white with a faint bluish tinge, and consists of slender, thin-walled, hyaline, widely septate hyphae, averaging 2 (occasionally 5 to 7) μ in diameter; the constrictions at the junctions between the main hypha and the lateral branches characteristic of *R. solani* are inconspicuous or absent, while clamp-connexions, another typical feature of the latter, are very rare. The few brown hyphae occurring among the predominantly hyaline growth fail to impart the familiar cinnamon colour of *R. solani.* In Petri dish cultures on starchy media, patches of the mycelium become converted into thin greenish to olivaceous-black flakes composed of narrow hyphae with brown walls interwoven into a small-celled mosaic. Under natural conditions the appearance of the diseased turf in England exactly resembles the descriptions of 'small brown patch' or 'dollar spot' in the United States. The *Rhizoctonia* from grasses in the latter country will not infect living potato tissue.

KOZLOWSKI (A.). **Little leaf or rosette of fruit trees in California.**—*Phytopathology*, xxv, 2, pp. 275–278, 1935.

Details are given of the writer's observations and experiments on a type of little leaf or rosette of peach, apple, and plum trees in California from which it is apparent that three factors are concerned in the disorder, namely, anaerobic soil conditions, infection by species of *Monilia* (probably of the *M. cinerea* [*Sclerotinia laxa*] group) specially prevalent on plums in deep sand, and climate (warm, rainless weather). In apple shoots infected by the *Monilia* the meristematic tissues of the terminal buds were entirely destroyed, the hairs of the scales being covered with the hyphae and conidia of the fungus, which was further isolated from brown spots in the bark parenchyma of peach buds. The leaves of the diseased trees are small, stiff, of glassy aspect, and clustered; a witches' broom-like growth of the shoots is tentatively attributed to another undetermined fungus. Little leaf was produced in controlled trials by simulating the adverse environmental conditions referred to above, and also by inoculation with the *Monilia*, but the latter requires further investigation.

BONGINI (V[IRGINIA]). **Seccherecciodi piante fruttifere.** [Drying-up of fruit trees.]—*Difesa Piante*, xi, 6, pp. 169–185, 1934.

After an inclement winter and spring, three- to six-year-old fruit trees in northern Italy showed a drying-up of the youngest branches and trunk which frequently proved fatal.

On apricots, dry, slightly wrinkled areas appeared on the trunk and

spread downwards, a necrosis of the underlying tissues extending to the cambium; the shoots dried up and the bark sometimes became detached. The trunks bore verrucose, black, depressed, stromatic fructifications of *Cytospora rubescens* [*R.A.M.*, xii, p. 281] with large, sinuous, irregularly distributed chambers lined with conidiophores, 30 to 35 μ long, bearing allantoid, hyaline, continuous conidia, 4 to 4·5 by 0·5 to 1 μ.

The only peach variety attacked was Early Hale, which is very susceptible to climatic influences. Affected trees showed necrosis of the subcortical tissues of the young branches, extending to the xylem. The internodes bore erumpent greyish-white pustules containing two or more spherical chambers disposed radially, measuring 100 μ in diameter, and lined with simple, hyaline conidiophores, 15 to 20 μ long, bearing cylindrical-curved, hyaline, continuous conidia, 5 to 7 by 1·5 μ. This fungus the author considers to be *C. cincta*. The pycnidia of *C. persicae*, measuring 55 to 65, with spores by 0·5 to 1 μ, were found around the dead shoots. Another *Cytospora*, of which the conidiophores measured 12 to 15 by 1 μ and the filiform, simple conidia 5 to 6·5 by 0·5 to 1 μ, was present on the trunks.

On apples and pears the affected branches bore fructifications of *C. microspora* [ibid., viii, p. 318] with polymorphous chambers containing bacillary conidiophores 16 to 18 μ long, and discharging through a central ostiole a white conidial cirrhus.

The author concludes that the wilt and death of the trees were due primarily to frost injury and adverse soil factors. Trees growing in good soil and belonging to varieties less susceptible to the effects of bad weather remained unaffected, and some of the affected trees which rapidly succumbed showed no fungal development.

Rose (D. H.), Brooks (C.), Fisher (D. F.), & Bratley (C. O.). **Market diseases of fruits and vegetables. Apples, Pears, Quinces.**—*Misc. Publ. U.S. Dep. Agric.* 168, 69 pp., 22 pl. (16 col.), 1933. [Received May, 1935.]

In this publication, one of a series designed to assist in the identification of economically important pathological conditions of fruits and vegetables during marketing and so facilitate market inspections, notes are given on the causes, symptoms, and control of nearly eighty diseases and types of physiological injury affecting apples, pears, and quinces in the United States. The book is illustrated with a valuable series of coloured plates, and there is a very full bibliography of the papers in English on the subject, comprising 244 titles.

Copisarow (M.). **A new method of fruit and vegetable preservation.**—*J. Soc. chem. Ind., Lond.*, liv, 13, p. 283, 1935.

Promising results in the prevention of moulds and decay in ripe apples, pears, citrus, pineapples, and bananas are stated to have been obtained in preliminary tests by spraying with solutions or suspensions of maleic acid in various ethereal oils, e.g., lemon and orange, ethyl and amyl acetate, iso-amyl valerate, the selection of which was governed by the flavour of the particular fruit to be treated.

THOMAS (P. H.) & RAPHAEL (T. D.). **Armillaria control in the orchard.**—*Tasm. J. Agric.*, N.S., vi, 1, pp. 1–6, 4 figs., 1935.

After pointing out the difficulty of detecting the presence of *Armillaria mellea* on the roots of orchard trees before considerable damage has been done to the hosts, the authors briefly discuss protective and preventive measures against its establishment on recently cleared land. Such land should not be planted with fruit-trees for several years owing to the presence in the soil of abundant rotting roots and wood chips almost certain to harbour the fungus. Drains should not be constructed of bush timbers, and the underground parts of fencing posts and permanent tree supports should be tarred or creosoted prior to erection. Care should be taken during cultivation to avoid injuring the fruit-tree roots. All wooden material showing the typical clusters of the sporophores at their base should be removed and burnt. In already infected orchards the less affected trees should have their roots uncovered in summer and left exposed to the action of sunlight, and two or three applications of iron sulphate (1 lb. in 4 galls. water) may be given at intervals of three or four weeks; permanganate of potash ($\frac{1}{2}$ oz. in 4 galls. water) has also proved successful in checking the development of the fungus. Progress of *A. mellea* rhizomorphs in the soil may be checked by digging a trench about 2 ft. deep around the infected areas.

HARRISON (T. H.) & EL-HELALY (A. F.). **On Lambertella corni-maris von Höhnel, a brown-spored parasitic Discomycete.**—*Trans. Brit. mycol. Soc.*, xix, 3, pp. 199–214, 1 pl., 3 figs., 1 graph, 1935.

A detailed account is given of the authors' morphological and cultural studies of a Discomycete with brown spores, which was collected by the senior author from mummified apples in Switzerland and from mummified pears in Germany in 1931, and which was found to be identical with one collected by von Höhnel in 1917 on mummified fruits of the cornelian cherry (*Cornus mas*) and described by him under the name *Lambertella corni-maris*. The fungus was cultured on a large variety of media, on most of which it produced a thick, dark brown or black pseudosclerotial crust from which apothecia with ascospores [microscopical details of which are given] were formed under suitable conditions of light, humidity, and acidity. The optimum P_H for growth was near 4·4, but growth occurred over a range from 1·6 to 8·3. The existence in nature of an imperfect stage appears to be doubtful.

The fungus was shown to be very active in the production of oxidizing enzymes and pectinase and to be able under laboratory conditions to attack a variety of fruits and vegetables, including apple, pear, plum, quince, orange, lemon, turnip, and parsnip. It was also apparently capable under experimental conditions of attacking apple and plum blossoms, but inoculations of young apple, pear, cherry, and plum wood gave negative results.

In discussing the taxonomic position of the fungus especially with reference to the opinion of Whetzel that it is a typical *Ciboria*, and the possibility that it may be identical with *Phaeosclerotinia nipponica* Hori found on apples in Japan, it is considered that for the present at least it should be known as *L. corni-maris* v. Höhn.

RIKER (A. J.), IVANOFF (S. S.), & KILMER (F. B.). **Antiseptic solutions and antiseptic adhesive tape in relation to control of hairy root, crown gall, and other overgrowths on nursery Apple trees.**—*Phytopathology*, xxv, 2, pp. 192–207, 1935.

The work of the first-named writer and his collaborators on the control of knots caused by *Phytomonas* [*Bacterium*] *rhizogenes* at the unions of piece-root grafted nursery apple trees at the Wisconsin Agricultural Experiment Station [*R.A.M.*, xiii, p. 778] has been continued. Mercuric chloride (1 in 1,000) and cadmium chloride (1 in 100) killed all the bacteria without apparent injury to the roots, and the former was successfully incorporated, at a concentration of 1 to 300 by weight, in the plaster masses of nurserymen's tape wrappers. Under ordinary conditions commercial control was secured merely by wrapping the graft unions with this antiseptic tape, but in cases of heavy infection, the seedling roots should be immersed a week before grafting in mercuric chloride (1 in 1,000) for one minute.

ROBERTS (J. W.) & PIERCE (L.). **Apple scab.**—*Fmrs' Bull. U.S. Dep. Agric.* 1478, 11 pp., 8 figs., 1935.

Popular notes are given on the economic importance, distribution, symptoms, life-history, effects on different varieties, and control of apple scab (*Venturia inaequalis*) in the United States.

BOTTOMLEY (A[VERIL] M.). **Sooty blotch on Apples.**—*Fmg. S. Afr.*, x, 106, p. 31, 2 figs., 1935.

The best control of sooty blotch (*Gloeodes pomigena*) on apples in South Africa was given in recent experiments by a one-minute dip in a 5 to 6 per cent. solution of bleaching powder (chloride of lime), followed by five to ten minutes' exposure and thorough washing in clean water, the fruit then being allowed to dry before packing [cf. *R.A.M.*, xii, p. 759]. Fly speck (*Leptothyrium pomi*), commonly associated with sooty blotch on light-skinned varieties, such as White Winter Pearmain, is not amenable to this treatment.

ROBERTS (J. W.) & PIERCE (L.). **Apple bitter rot and its control.**—*Fmrs' Bull. U.S. Dep. Agric.* 938, 10 pp., 4 figs., 1935.

A popular account (superseding that issued in April, 1918) is given of the symptoms, etiology, mode of dissemination, life-history, and control of bitter rot of apples (*Glomerella cingulata*) [*R.A.M.*, xiv, p. 40]. The disease is most serious in the southern States on the Givens, Jonathan, Missouri Pippin, Ben Davis, and Grimes Golden varieties in the order named. Directions are given for the removal of the over-wintering sources of infection (mummied fruit and cankers) during the dormant period and for treatment with Bordeaux mixture (4–4–50), which should ordinarily commence about 15th June and terminate between 1st and 5th August.

NITIMARGI (N. M.). **Studies in the genera Cytosporina, Phomopsis, and Diaporthe. VII. Chemical factors influencing sporing characters.**—*Ann. Bot., Lond.*, xlix, 193, pp. 19–40, 6 figs., 2 graphs, 1935.

Using the method suggested by Seth [*R.A.M.*, xiii, p. 524] for the

determination of the chemical factors that influence the growth in culture of fungal strains attacking the apple, the author showed that in the strains tested by him (two strains of *Cytosporina ludibunda*, one of *Phomopsis* sp. from rose stems, two of *P. coneglanensis*, three of *P. citri*, and *Diaporthe* No. 159) increasing concentrations of sugar in the culture medium brought about a significant increase in the dimensions of the spores. In strains producing 'A' and 'B' spores [ibid., ix, p. 547] in the standard medium (2 gm. glucose per litre) the number of 'B' was increased and that of 'A' spores correspondingly decreased with increasing sugar, and at 128 gm. glucose per litre all the spores were of the 'B' type; in those that only give 'A' spores in the standard medium, 'B' spores were formed at the higher concentrations, except in *Diaporthe*. With a strain of *P. citri* which produced 'A', 'B', and 'C' (intermediate) spores in the standard medium, the number of the two last types was increased ('B' predominating), and that of 'A' spores was correspondingly decreased with excess of sugar. Increase in nitrogen, on the other hand, did not in any case induce the formation of 'B' spores, and caused a decrease in the number of 'B' spores in the strains which produced 'A' and 'B' spores in the standard medium. Increasing the sugar content of media rich in asparagin overcame the tendency to check the formation of the 'B' spores.

Variations in acidity or alkalinity and in other laboratory conditions of temperature or light did not appear to have a significant effect on the numerical proportions and dimensions of the different kinds of spore.

Du Plessis (S. J.). **Excessive drop of Winter Nelis blossoms.**—*Fmg. S. Afr.*, x, 107, p. 75, 1935.

Two types of blossom drop of Winter Nelis pears were encountered in an orchard in the Somerset West district of Natal. The most prevalent is characterized by the brown and yellowish discoloration, respectively, of the calyces and rest of the blossom before dropping, and is attributed to lack of cross-pollination. The other type is marked by blackening of the calyces and sometimes of the blossom stems before dropping; pure cultures of *Bacterium nectarophilum* [*R.A.M.*, xiii, p. 426] were readily obtained from the affected tissues. This organism may possibly be able to overwinter in old infected blossoms in the soil, in soil contaminated by the organism during the previous season, or in the fruit buds and between the bud scales, but there was no evidence of its hibernation in the old fruit spurs on which the diseased blossoms were borne, or in any part of the beehive, the duration of viability in honey being only about seventy hours. Bees are, however, the most important vectors of the disease, small insects and wind playing only a minor part in its dissemination. Positive results were given by the inoculation of blossoms with a suspension of crushed bees caught in the infected orchard, and with the water used for washing a hive in the vicinity [cf. ibid., xiv, p. 370].

Proper and timely pollination would seem to be the most important measure against excessive blossom drop of the type under discussion, the bacterial disease being responsible for only 10 to 20 per cent. of the damage in the experimental orchard. However, in localities where it may prove to be of greater significance, adequate control should be

given by the ordinary spraying with lime-sulphur and Bordeaux mixture used against *Fusicladium* [*Venturia pirina*].

GOIDÀNICH (G.). **Un marciume della Pesche causato da due specie di 'Fusarium' (Fusarium herbarum (Corda) Fr., f.1 Wr. e Fusarium poae (Peck) Wr.).** [A Peach rot caused by two species of *Fusarium* (*Fusarium herbarum* (Corda) Fr., f.1 Wr. and *Fusarium poae* (Peck) Wr.).]—*Boll. Staz. Pat. veg. Roma*, N.S., xiv, 4, pp. 475–491, 7 figs., 1934. [English summary.]

A full account is given of a peach rot, apparently not previously recorded in Europe, caused by *Fusarium herbarum* f. 1 and *F. poae* [cf. *R.A.M.*, iv, p. 487]. The disease attacked the fruit when very nearly ripe and still on the tree, and spread rapidly after picking. The affected fruits developed a large salmon-pink or vinous-red area surrounded by a white ring of aerial mycelium, the lesion being of the former colour when due wholly or mainly to *F. herbarum* and of the latter when due to *F. poae*. In practically every instance infection had taken place through insect punctures.

Artificial inoculations with both organisms, separately and together, gave positive results on wounded and unwounded fruits, infection being favoured by wounds, ripeness, and atmospheric humidity. The most susceptible variety (in nature) was Krummel October, with 5 to 10 per cent. infection.

Control consists in the prompt destruction of affected material.

ARNAUD (G.) & BARTHELET (J.). **Essais de traitements des arbres fruitiers et de la Vigne en 1934.** [Experiments in the treatment of fruit trees and of the Vine in 1934.]—*C.R. Acad. Agric. Fr.*, xxi, 5, pp. 186–189, 1935.

Excellent control of pear scab (*Venturia pirina*) on the susceptible Doyenné d'hiver and Beurré d'Hardenpont varieties was obtained in 1934 by three applications of 2 per cent. Bordeaux mixture on 16th April, 7th to 8th, and 19th May, of which the first was the most efficacious. The late attacks of unwonted severity occurring in October [cf. *R.A.M.*, xiii, p. 384] were not, however, completely prevented by the ordinary schedule, and experiments are planned to determine the value of a September application against this phase of the disease.

Copper oxychloride [concentrations not stated] gave adequate control of downy mildew (*Plasmopara viticola*) on Carignan vines.

GOIDÀNICH (G.). **La leptonecrosi dei Ciliegi e degli Albicocchi.** [Leptonecrosis of Cherries and Apricots.]—*Boll. Staz. Pat. veg. Roma*, N.S., xiv, 4, pp. 531–540, 4 figs., 1934. [English summary.]

After pointing out that non-parasitic leptonecrosis of plums in Italy [*R.A.M.*, xiv, p. 320] resembles pathologically the cambial degeneration and necrosis of apples and pears recently described by Petri [ibid., xiv, p. 317], the author states that he observed Lindegg's cherry wilt [ibid., xiii, p. 247] on cherry trees of all ages near Bologna, and that careful cultural and anatomical studies demonstrated that no parasitic organism was present and that the pathological characters resembled those of plum leptonecrosis.

Leptonecrosis was also observed on two 20- to 25-year-old apricots grafted on myrobolan plum and growing in well-manured soil in a situation in which they had probably been exposed to severe cold. Burbank plums growing in the vicinity had already shown the same condition for some years. In the affected branches the rust-red discoloration was restricted to the middle of the phloem, the wood being unaffected.

From the available evidence the disease would appear to have been due to maladaptation between stock and graft, though its appearance twenty years after grafting does not support this view. It is tentatively suggested that it may belong to the virus group of diseases, and further investigations are being made to elucidate this point.

MAGIE (R. O.). **Variability of monosporic cultures of Coccomyces hiemalis.**—*Phytopathology*, xxv, 2, pp. 131–159, 6 graphs, 1935.

The essential features of this expanded description of the writer's studies on the variability of monospore cultures of *Coccomyces hiemalis*, the agent of cherry-leaf spot in the United States, have already been noticed from a preliminary account [*R.A.M.*, xiv, p. 376].

DARROW (G. M.) & DETWILER (S. B.). **Currants and Gooseberries: their culture and relation to White Pine blister rust.**—*Fmrs' Bull. U.S. Dep. Agric.* 1398, 42 pp., 26 figs., 2 maps, 1934.

This bulletin on the cultivation of currants and gooseberries in the United States in relation to white pine blister rust [*Cronartium ribicola*] is a revision of No. 1024 in the same series [*R.A.M.*, iv, p. 100]. The section on diseases is contributed by C. L. Shear. The considered policy of the Department of Agriculture is to exclude the cultivated black currant from all parts of the States, its eradication being particularly urgent in the Pacific, Rocky Mountain, Atlantic, Appalachian, Ohio and Upper Mississippi Valleys, and Lake States [ibid., xiv, p. 220].

JOHNSON (M. O.). **The Pineapple.**—xii+306 pp., 2 col. pl., 94 figs., Paradise of the Pacific Press, Honolulu, 1935.

This attractively produced and competently written monograph of the pineapple should be a valuable addition to the literature, and its up-to-date account of the diseases and pests of the crop (especially those found in Hawaii) will undoubtedly make it useful to phytopathologists in all pineapple-producing countries. The diseases discussed include wilt, four types of which are stated to occur in Hawaii, namely, that due to 'starvation' (chiefly of nitrogen), that caused by nematodes, 'swamp' wilt in poorly drained areas (probably caused by species of *Pythium* and *Phytophthora*), and 'quick' wilt due to the activity of mealy bugs (*Pseudococcus brevipes*) [*R.A.M.*, xiv, pp. 84, 379]; root rots associated with *Nematosporangium rhizophthoron* [*Pythium arrhenomanes*: ibid., xi, p. 129; xiv, p. 95] and species of *Fusarium*, *Verticillium*, *Rhizoctonia*, and with *Rhizidiocystis ananasi* [ibid., viii, p. 657]; heart rot (*Phytophthora* spp.) [ibid., xiii, p. 527]; leaf spot, base rot, and black fruit rot (all due to *Thielaviopsis* [*Ceratostomella*] *paradoxa*); green fruit rot (*P. meadii*); ripe fruit rot; Kauai disease, a dry rot of a few of the eyes of the green fruit of uncertain cause described by Lyon in 1915 (*H.S.P.A.*

Planters' Rec., v, 13, pp. 125–139); fruit fermentation; bacterial fruitlet or black rot attributed by Serrano to *Erwinia* [*Bacillus*] *ananas* [ibid., xiv, p. 182] but stated by Sideris and Caldis to be due to an associated white bacterium, the yellow *B. ananas* being non-pathogenic; pink disease of the fruit caused by a bacterium and described by Sideris and Waldron in 1930 (*Pine News*, v, 4, pp. 79–93) as of comparatively small economic importance; eye rot (exogenous brown discoloration) of the fruit, caused by species of *Fusarium* and *Penicillium*; various fruit rots and blemishes caused by insects or physiological troubles; and the yellow spot virus disease [ibid., xii, p. 304].

In an appendix a key is given for the identification of the species and varieties of the genus *Ananas*, and the book terminates with very full references to literature up to 1933.

SERRANO (F. B.). **Fruitlet black-rot of Pineapple in the Philippines.**—*Philipp. J. Sci.*, lv, 4, pp. 337–362, 6 pl., 1934.

This is a full account of the author's studies of bacterial black rot of pineapple fruitlets [see preceding abstract] which is stated to be one of the two major diseases of the crop in the Philippines, wherever the Smooth Cayenne variety is grown. Isolations from affected tissues, later confirmed by pathogenicity tests [details of which are given], showed that the condition is caused by a white, strictly aerobic, rod-shaped organism with rounded ends, a technical description of which is given, and which is named *Phytomonas* (*Bacterium* or *Pseudomonas* under Smith's or Migula's classification) *ananas* n.sp. It occurs usually in pairs, but also singly and sometimes in short chains, varies considerably in size depending on age (1·8 by 0·6 μ in 24-hour-old and smaller in older cultures), is motile by 1 to 4 polar flagella three or four times the length of the body, does not produce spores or capsules, is Gram-negative and not acid-fast, and is capable of producing a green pigment. On agar it forms white colonies becoming ivory-yellow, with undulate to lobate edges, a smooth or rugose surface, radiately ridged, pulvinate to effuse. It liquefies nutrient gelatine and Loeffler's blood serum, slowly reduces litmus without the production of acid, does not hydrolyse starch, ferments glucose readily, xylose, mannite, and lactose feebly, but not saccharose, reduces nitrates, and does not produce either hydrogen sulphide or indol. Its optimum temperature for growth is between 31° and 33° C., with death point between 51° and 53°, and the optimum reaction for growth is about P_H 5·5 in cultures with about 6 per cent. sugar. According to the chart of the Society of American Bacteriologists its index number is 5322–31124–2223.

In discussing the symptoms of the disease, the author states that it is evidently identical with a similar condition of the pineapple reported by Barker from Haiti [*R.A.M.*, v, p. 618], but is distinct from, and more serious than, the bacterial fruitlet brown rot previously described and attributed by himself to *Erwinia* [*Bacillus*] *ananas* [ibid., vii, p. 794 and preceding abstract].

Observations suggested that *Bact. ananas* enters the pineapple fruitlets during development through decaying floral parts, mechanical cracks which are generally present in large fruits, and ruptured fissures running from the eye cavity into the placental lobes. The fact that

individual plants remained healthy till maturity in spite of having been profusely sprayed with suspensions of the bacterium would suggest that such plants are very resistant to, if not immune from, the disease.

SERRANO (F. B.). **Pineapple mealy-bug wilt in the Philippines.**—*Philipp. J. Sci.*, lv, 4, pp. 363–377, 5 pl., 1934.

The main point of interest in this paper is an account of artificial colonization experiments on Smooth Cayenne pineapple plants, the results of which conclusively proved that the pineapple mealy bug (*Pseudococcus brevipes*) is the primary and true cause of mealy bug wilt in the Philippines, which appears to be identical with that reported from Haiti and Hawaii [see above, p. 455]. The author considers that the insect evidently secretes a non-living toxic principle which causes the wilting of the host, producing typical wilt symptoms in about two months. He also distinguishes the slow and quick types of the disease noticed by Carter [*R.A.M.*, xii, p. 520], as well as the green spotting described by the latter in some cases [loc. cit. and ibid., xiii, p. 586]; this last symptom was shown not to be an important characteristic of wilt (although it is very common in cases of quick wilt), and to be produced by a grey strain of the insect, while another pink strain only causes chlorotic spots that are characteristic of both types of wilt, and is more commonly associated with the slow wilt.

The abundance and general vigour of the mealy bug colonies appeared to be greatly favoured in the field by the co-operation of two species of ants, namely, *Pheidole megacephala* and *Solenopsis geminata*.

LEWCOCK (H. K.). **Pineapple wilt disease and its control.**—*Qd. agric. J.*, xliii, 1, pp. 9–17, 2 figs., 1935.

This is a semi-popular account of the serious wilt caused in Queensland by the parasitic activity of *Phytophthora cinnamomi* and other fungi on the roots of the pineapple, the symptoms of which are briefly described [*R.A.M.*, viii, p. 53; xiii, p. 215]. The disease must be distinguished from a somewhat similar condition of the host due to nematodes (*Heterodera marionii*) or white grubs (*Lepidiota* spp.), either or both of which may be associated with it. The mealy bug (*Pseudococcus brevipes*) wilt [see preceding abstract] is stated not to have been found as yet in Queensland. In the wilt disease caused by fungi the most striking symptom is the collapse of the foliage, which in the earlier stages turns a drab-olivaceous colour. If the fruit has not formed its development is arrested and it colours prematurely, the stalk withering for some inches below the base of the fruit though not enough to cause the latter to collapse. The roots of affected plants are rotted, often in advance of any foliage symptoms, and in advanced stages the plant may be very easily pulled out. The disease starts in late winter or early spring and develops in the summer, new lands becoming infected after a few years. The attacks are sporadic but may be widespread in favourable seasons. Heavy rainfall favours the disease, especially as many of the pineapple soils are relatively impervious and readily waterlogged. Surface erosion also conduces to the disease by weakening the root system and denuding the soil of organic matter, soils containing less than 3 per cent. of which are unsuited to the plant. Soil reaction is also

important, as the disease has not been observed in soil more acid than P_H 5·1, whereas the optimum growth of the host is found locally in soils from P_H 4·5 to 5.

Suggestions based on these considerations are given for the control of the disease, especially by endeavouring to adjust the soil reaction to P_H 5 or below, as by a single application of 600 or 700 lb. sulphur in the less acid coastal districts. Good drainage is equally important and organic material should be plentifully supplied.

LEWCOCK (H. K.). **Top rot of Pineapples and its control.**—*Qd. agric. J.*, xliii, 2, pp. 145–149, 1 pl., 1935.

Pineapple heart or top rot in Queensland is associated with *Phytophthora cinnamomi* alone of the species of this genus found in the similar disease in Hawaii [*R.A.M.*, xiii, p. 527; xiv, p. 194] and is becoming increasingly prevalent. It usually attacks plants before they have fruited. Shortly after infection, the central leaves turn drab olivaceous-green to red, dry out rapidly, and curl back along the edges, eventually showing a characteristic smoky-brown appearance before they disintegrate and fall to the ground. The outer leaves may remain apparently normal until the disease is well advanced. A slight pull detaches the terminal crown of leaves from the stem even before the foliage symptoms have become well defined, this being a useful means of diagnosis in the early stages. The bases of the affected leaves develop a malodorous, putty-coloured, rotted area sharply demarcated from the upper green part by a distinct brown margin. The apex of the stem shows a similar rot, also characterized by a well-defined brown margin, but the infection does not usually spread to the woody tissue of the rootstock.

The fungus enters through fresh cuts or injuries, decaying roots, or the tender apical stem tissues. When the roots alone are infected a wilt disease is produced [see preceding abstract] and this sometimes continues up into the stem and leads to top rot, the early sporadic infections of which are frequently thus initiated. Under favourable conditions of moisture and temperature, spores from these first diseased plants are disseminated to healthy plants by the movements of surface water or heavy rain. *P. cinnamomi* can survive in the soil for a considerable time, and being actively parasitic on pineapple roots is likely to reappear indefinitely once the soil has become infected.

Top rot losses occur chiefly in winter and spring. Usually, certain parts of a plantation show a high incidence of the disease, while the remainder may be almost unaffected; losses of 50 to 60 per cent. have occurred. The prevalence and severity of infection are largely determined by environmental conditions. In Queensland serious losses are caused only in exceptionally rainy seasons, and even then epidemics are confined to badly drained localities and districts liable to flooding. Plants propagated from tops or slips, their loose, open structure rendering the heart tissues liable to pollution by flood water, are more readily infected than those grown from suckers.

No special control measures, except the prompt removal and destruction of diseased plants, are necessary in hilly, well-drained areas. Elsewhere, the suckers or slips should be planted on low ridges; plantings

in flat country must not be made in trenches. Planting material intended for old land where outbreaks have already occurred should be treated with Bordeaux mixture by the Hawaiian method [loc. cit.].

TIMS (E. C.). **A Stilbum disease of Fig in Louisiana.**—*Phytopathology*, xxv, 2, pp. 208–222, 2 figs., 1935.

Most of the information contained in this paper on the fig (*Ficus carica*) disease caused by *Stilbum cinnabarinum* in Louisiana has already been summarized [*R.A.M.*, xiii, p. 789], but the present expanded account comprises a review of the relevant literature, a bibliography of thirty-six titles, and observations on the morphology of the fungus. A genetic connexion was traced both in nature and in culture between the conidial (*Stilbum*) and the associated ascigerous stage *Megalonectria pseudotrichia* (Schw.) Speg. The bright red perithecia of the latter measure 475 to 525 μ in diameter when fresh, and are occupied by asci 80 to 130 by 16 to 20 μ (average 100 by 17 μ), containing eight hyaline, muriform ascospores, 20 to 40 by 9 to 14 μ, with 5 to 7 transverse septa.

JENKINS (ANNA E.). **Sphaceloma perseae the cause of Avocado scab.**—*J. agric. Res.*, xlix, 10, pp. 859–869, 4 pl. (1 col.), 1934.

This is a full report of the author's cultural and pathogenicity studies of *Sphaceloma perseae* [*R.A.M.*, xiii, p. 386] on avocado (*Persea americana*) [*P. gratissima*], including an English technical description of the fungus. The results showed that in Florida the avocado varieties Challenge, Perfecto, and Surprise, of the Guatemalan race, are susceptible to infection with *S. perseae*, in addition to the varieties which were already known to be highly susceptible there, namely, Fuerte and Lulu (Mexican-Guatemalan hybrids), Trapp (West Indian race), and Taylor (Guatemalan race). In Cuba and Porto Rico native avocado varieties are stated to be rarely attacked, while in Brazil scab in severe form was only observed on avocados originally from Florida but not on the native varieties. The occurrence of the fungus in Rhodesia [loc. cit.] is stated not to have been verified so far. Cross-inoculation experiments indicated that *S. perseae* is not pathogenic to citrus and that *S. fawcettii* [loc. cit.] does not attack avocados.

WILSON (J. D.) & RUNNELS (H. A.). **Transpirational response of various plants to Bordeaux mixture.**—*Bi-m. Bull. Ohio agric. Exp. Sta.* 171, pp. 198–202, 1934. [Abs. in *Exp. Sta. Rec.*, lxxii, 4, pp. 490–491, 1935.]

When forty-one different species of plants were sprayed under greenhouse conditions with Bordeaux mixture (6–4–50) the nightly increase in the transpiration rate (7 P.M. to 7 A.M.) ranged from 8 per cent. for celery to 375 per cent. for *Coleus* and the total 24-hour increase from —2 per cent. for stocks [*Matthiola incana*] to 33 per cent. for cucumber. In the unsprayed plants the percentage of nightly water loss ranged from 4 per cent. for beets and peppers [*Capsicum annuum*] to 37 per cent. for celery. In the outdoor test the transpiration increases due to spraying ranged from 104 per cent. for maize and beans to 121 per cent. for hollyhocks in soil containing about 50 per cent. of its water-holding

capacity, and from 91 per cent. for maize to 116 per cent. for tomatoes on soil containing about 30 per cent. moisture. In the drier soil the sprayed plants wilted more severely than the controls, and leaf-burning was occasionally severe enough to reduce the transpiration capacity [*R.A.M.*, xii, p. 459].

NEWHALL (A. G.). **Theory and practice of soil sterilization.**—*Agric. Engng, St. Joseph, Mich.*, xvi, 2, pp. 65–70, 5 figs., 3 graphs, 1935.

Soil sterilization for the control of fungal, bacterial, insect, and nematode pathogens of vegetables and ornamentals in the United States is discussed from the theoretical and practical standpoints under the headings of chemical disinfection, steam sterilization methods, and electric soil sterilization [cf. *R.A.M.*, xii, p. 42].

All the chemicals so far tested for the purpose in view, including formaldehyde (the cost of which is estimated at about 1 cent per sq. ft.), glacial acetic acid, carbon bisulphide, and mercuric chloride or other mercury compounds are open to various objections, and steam sterilization is considered to be preferable for durable results. Three methods of steam sterilization are now in use, viz., the buried perforated pipe, steam pan, and buried tile systems. By the first method the soil is sterilized from 3 to 6 in. deeper than by the pan system in about the same time, but rather more fuel is consumed. With the pan system partial sterilization is obtained at a depth of 5 to 10 in., and 2·7 sq. ft. per hour per boiler h.p. can be treated at a cost of 0·6 to 1·2 cents per sq. ft. The buried tile system is more effective and of greater permanency than either of the others. The annual charge of steaming, reckoning interest on the installation and the cost of fuel, comes to some $500 per acre. Buried tiles have been in use for 15 to 18 years compared with two to six for the other systems under discussion.

Electric soil sterilization is still in the experimental stage but the outlook for its extension is regarded as promising. In preliminary tests at the Cornell Agricultural Experiment Station in 1934 it was found that most soil pathogens succumb to temperatures considerably below the boiling point of water. The cost of the treatment has been estimated to range from 3 to 6 cents per cu. ft.

SENNER (A. H.). **Application of steam in the sterilization of soils.**—*Tech. Bull. U.S. Dep. Agric.* 443, 19 pp., 2 diags., 3 graphs, 1934. [Received May, 1935.]

After a brief description of the four most common methods of steam sterilization of soil in the greenhouse [the three mentioned in the preceding abstract and the steam rake or harrow], the author gives some details of limited tests conducted with the main purpose of determining the effect of initial steam pressure on the final moisture content and temperature of the soil, and the quantity of steam needed per surface unit. The results indicated that the moisture content is increased during sterilization but is not materially affected by variations of steam pressure, and that soil temperatures in excess of about 212° F. can only be obtained by using superheated steam. The paper also contains some practical advice concerning the lay-out of steam-sterilization plants.

Morstatt (H.). **Die jährlichen Ernteverluste durch Pflanzenkrankheiten und -schädlinge.** [The annual yield reductions through plant diseases and pests.]—*Kranke Pflanze*, xii, 2, pp. 17–19, 1935.

Some figures are given to illustrate the extent of the annual losses sustained in Germany through plant diseases and pests, amounting on an average to RM. 2,000,000,000 [*R.A.M.*, viii, p. 455]. At an extremely conservative estimate, diseases are responsible for a reduction of 10·8 per cent. (RM. 860,000,000) in the aggregate yield of the principal cultivated crops—cereals, potatoes, sugar beets, vegetables, fruit, and vines—valued at RM. 6,500,000,000. Professor Appel has calculated that at least a quarter of these immense losses could be saved by judicious plant protection propaganda, while other experts believe that within a few years the damage might be reduced to half its present amount by properly organized control measures.

Brooks (C.). **Some botanical aspects of perishable food products.**—*Sci. Mon., N.Y.*, xl, 2, pp. 122–137, 6 figs., 4 graphs, 1935.

Some interesting observations, supported by statistical data and citations from the literature, are made on various physiological, biochemical, and pathological aspects of the storage of perishable foods, and on recent developments and improvements in this field in various countries. Most of the later work referred to has been noticed in this *Review*. In connexion with some figures of losses in goods of this category [cf. *R.A.M.*, xiii, p. 176], it is stated that the total claims paid by the American railways on freight shipments of fresh fruits and vegetables in 1932 was $7,203,145, almost equalling the sum paid on all other commodities, though representing only 3 per cent. of the total cars handled. These figures do not include the losses in transport other than by rail, in storage, or in the wholesale and retail markets. Tomatoes suffered the most extensive damage on the railways, the claims per car in respect of this product averaging $24·89, followed by lettuce ($19·44), carrots ($18·35), and watermelons ($17·24); the corresponding figures for oranges, apples, onions, and potatoes (sweet and white) were only $6·20, 5·88, 4·37, 3·27, and 1·05, respectively.

Meier (F. C.) & Lindbergh (C. A.). **Collecting micro-organisms from the Arctic atmosphere.**—*Sci. Mon., N.Y.*, xl, 1, pp. 5–20, 10 figs., 2 maps, 1935.

This is an expanded account of the writers' collaborative studies on the micro-organisms of the Arctic atmosphere, a note on which has already appeared [*R.A.M.*, xiv, p. 384]. The second-named writer was responsible for the special device [which is fully described and figured], known as a 'sky hook', used for catching the spores, and also supplied field notes and maps. The species of fungi represented in the collection have been tentatively assigned to the genera *Macrosporium*, *Cladosporium*, *Leptosphaeria*, *Mycosphaerella*, *Trichothecium*, *Helicosporium*, *Uromyces*, *Camarosporium*, and *Venturia*.

Wiltshire (S. P.). **Some further notes on the preservation of Petri dish cultures.**—*Trans. Brit. mycol. Soc.*, xix, 3, pp. 259–260, 1935.

In this brief note the author describes some modifications of the

method suggested by him for the indefinite preservation of Petri dish fungal cultures [*R.A.M.*, x, p. 257], designed for the improvement of the adherence of old cultures to the wax, and also to facilitate the transfer of the cultures from the dish to the drying disk.

ATANASOFF (D.). **Old and new virus diseases of trees and shrubs.**—*Phytopath. Z.*, viii, 2, pp. 197–223, 17 figs., 1935.

This account of some relatively unfamiliar virus diseases of trees and shrubs is preceded by a brief review of old records of the subject, from which it would appear that a condition evidently allied to bitter pit of apples [*R.A.M.*, xiv, pp. 316, 369] attracted attention [? in England] as early as the middle of the twelfth century, while the infectious nature of jasmine chlorosis (first observed in Bulgaria in 1934) [ibid., vii, p. 386] was recognized towards the close of the seventeenth.

The following are among the disorders investigated by the writer in Bulgaria: mosaic of Canadian poplar (*Populus balsamifera*), hazel nut (*Corylus*) [*avellana*], elm, fig [ibid., xiv, p. 252], maple (*Acer negundo*), *Cornus mas*, ash, and lilac (on which the symptoms resemble the graft blight described by Chester from the United States) [ibid., x, p. 599], the last-named also contracting a form of ring spot; infectious variegation of *Laburnum vulgare*; and witches' broom of *Robinia pseud-acacia* [ibid., xii, p. 405], which is also liable to a foliar mottling and deformation similarly affecting *Gleditschia triacanthos*. In connexion with a discussion on mulberry 'dwarf' or 'curl' ('ishikubyo' or 'shikuyobyo') in Japan and Central Asia [ibid., xi, p. 756], mention is made of Ichitkawa's comparison of the disease in 1896 (*Bot. Mag., Tokyo*, ix, p. 82) with peach yellows [ibid., xiv, p. 219]. Notes are also given on various other disturbances known or suspected to be of virus origin [to most of which reference has been made from time to time in this *Review*], and a bibliography of seventy-six titles is appended.

McLENNAN (E[THEL] I.). **Non-symbiotic development of seedlings of Epacris impressa Labill.**—*New Phytol.*, xxxiv, 1, pp. 55–63, 1 pl., 4 figs., 1935.

The presence of an endotrophic mycorrhizal fungus, closely resembling that associated in Europe with the Ericaceae, has been reported by H. C. Baron (in an unpublished thesis) in the roots of *Epacris impressa*, a member of the nearly allied family of Epacridaceae, in Australia. In contrast to *Calluna vulgaris*, however, the aerial organs of *E. impressa* have shown no trace of infection. Seedlings of the latter were raised asymbiotically by the writer and Baron on nutrient agar gels and on sterile sand moistened with Miss Rayner's nutrient solution A [*R.A.M.*, x, p. 496]. The plantlets on agar developed no roots but were grown in the laboratory for three years and formed healthy green shoots, absorption of nutrients apparently taking place through the hypocotyl. Those on sand with the nutrient solution made normal growth and developed a fair root system which was free from mycorrhizal infection. It is apparent from these results that the decisive factor in the development or non-development of the roots was the physical or chemical character of the medium, the gel being impenetrable by the fine rootlets whereas no arresting action was exercised

by the sand. It follows, therefore, that the absence of a root system is in no way contingent on failure of association with the appropriate mycorrhizal form [cf. ibid., xiv, p. 247].

PEYRONEL (B.). **Il sapore e alcune reazioni microchimiche delle micorrize ectotrofiche prodotte da Russule e Lattarii.** [The flavour and some microchemical reactions of the ectotrophic mycorrhiza produced by species of *Russula* and *Lactarius*.]—*Nuovo G. bot. ital.*, N.S., xli, 4, pp. 744–746, 1934.

The author has found that not only are there structural similarities between the mycorrhizal mantles produced by species of *Lactarius* and *Russula* [which are listed] on beech, birch, and larch [*R.A.M.*, i, p. 306] and their corresponding hymenophores, but also that there is a similarity of flavour. The mycorrhiza produced by species with a pungent flavour were also pungent, while those produced by non-pungent species were sweet. The mycelial mantle in the mycorrhiza produced by *Russula* spp. showed certain characteristic colour reactions similar to those of the cystidia and laticiferous vessels of the hymenophores.

SNELL (K.). **Die Bewertung der Sorten von Kulturpflanzen nach ihrer Widerstandsfähigkeit gegen Krankheiten.** [The varietal evaluation of cultivated plants by their resistance towards diseases.]—*NachrBl. dtsch. PflSchDienst*, xv, 2, pp. 13–14, 1935.

The general principles of breeding for resistance to disease in cultivated plants are briefly illustrated by means of some familiar examples [attention to which has frequently been drawn in this *Review*]. Up to the present these principles have found a wide practical application in Germany only in the case of potato wart [*Synchytrium endobioticum*: see below, p. 465], involving the annual testing at the Biological Institute, Berlin-Dahlem, of some 10,000 seedlings for their reaction to this disease [cf. ibid., xiv, p. 400], but there is every prospect of an extension of the work in other fields.

ALLEN (M. C.) & HAENSELER (C. M.). **Antagonistic action of Trichoderma on Rhizoctonia and other soil fungi.**—*Phytopathology*, xxv, 2, pp. 244–252, 1935.

An extended account, supplemented by tables, is given of the experiments briefly described in a preliminary note by the second-named writer on the antagonism of *Trichoderma* (?) *lignorum* to *Rhizoctonia* [*Corticium*] *solani* and *Pythium de Baryanum* causing seed decay and damping-off of cucumbers [*R.A.M.*, xiv, pp. 53, 248]. A similar but less marked response is stated to have been obtained with garden peas attacked by *C. solani*. The filtrate from a five-day-old culture of *T. lignorum* was found to be lethal to *C. solani* at full strength or at dilutions not exceeding 40 per cent. Ten minutes' heating at 100° C. completely inactivated the toxic principle in the filtrate, while the same period at 90° or 80° reduced its virulence considerably and slightly, respectively. Similar results were obtained by bubbling oxygen through the filtrate in cotton-plugged test-tubes for twenty days at room temperature. *C. solani* made no growth in a freshly prepared, sterilized, five-day-old *Trichoderma* filtrate, but developed profusely in a similar

filtrate the toxicity of which was destroyed by the above-mentioned treatments.

Reid (R. D.). **Some properties of a bacterial-inhibitory substance produced by a mold.**—*J. Bact.*, xxix, 2, pp. 215–221, 1935.

The salient features of this study on the properties of a bacterial-inhibitory substance produced by a *Penicillium* closely allied to *P. notatum* (*P. chrysogenum* group) have already been noticed [*R.A.M.*, xii, p. 387].

Michaelis (P.). **Entwicklungsgeschichtlich-genetische Untersuchungen an Epilobium. IV. Der Einfluss des Plasmons auf Verzweigung und Pilzresistenz.** [Evolutionary and genetical investigations on *Epilobium*. IV. The influence of the plasmon on branching and fungal resistance.]—*Ber. dtsch. bot. Ges.*, liii, 1, pp. 143–150, 3 figs., 1935.

In continuance of his studies on the influence of the plasmon [cytoplasm of the egg-cell] on the inheritance of characters by the nuclear genes [genom] the author compared the behaviour of *Epilobium hirsutum* plants with *E. luteum* × *E. hirsutum* hybrids repeatedly back-crossed with *E. hirsutum* pollen. Marked differences in reaction to infection by *Erysiphe* sp. were observed between the parent species in experimental pots, *Epilobium hirsutum* being heavily attacked and *E. luteum* immune. The former were so severely infected that in many cases the leaves of the lower whorl were destroyed. The axillary shoots developing subsequent to infection were misshapen and bore only stunted leaves. In the F_{11} progeny of the back-crosses, which resembled the *E. hirsutum* plants but had *E. luteum* plasmon, the attack of mildew was very much milder, and caused only slight injury.

Ashworth (Dorothy). **The receptive hyphae of the rust fungi.**—*Ann. Bot., Lond.*, xlix, 193, pp. 95–108, 5 figs., 1935.

The author's histological studies of material of the following rusts, namely, *Coleosporium tussilaginis*, *Endophyllum sempervivi*, *Melampsora larici-caprearum*, *M. larici-populina*, *Melampsoridium betulinum*, *Phragmidium violaceum*, and *Puccinia malvacearum*, showed that in these rusts emergent hyphae of the stomatal and intercellular types are of frequent occurrence, and that their development is not confined to spermogonia and aecidia, since they may occur together with other spore forms and also in the rusts that do not form aecidia and spermogonia. A discussion of the significance of these observations is left for later publication.

Köck (G.) & Greisenegger (K.). **Tätigkeitsbericht des Kartoffel-Fachausschusses über das Jahr 1934.** [Report on the work of the Potato Expert Committee for the year 1934.]—*Neuheiten PflSch.*, xxviii, 1, pp. 4–6, 1935.

A summarized account is given of the activities of the Austrian Potato Expert Committee in 1934. To the eight types of potato viruses previously recognized in Austria was added a hitherto unobserved form of mosaic-crinkle found at Petzenkirchen.

A considerable extension of wart disease [*Synchytrium endobioticum*]

was recorded from Styria [ibid., xiii, p. 322]. The encouraging results given by the 1933 experiments in the control of this disorder on the susceptible Wohltmann variety by soil applications of sulphur were partially maintained in 1934 in respect of freedom from infection, but the growth of the plants was adversely affected by the more efficacious treatments with 600, 800, or 1,000 gm. per sq. m.

Three applications of 1 per cent. Bordeaux mixture at the beginning of July, August, and September successfully controlled *Phytophthora* [*infestans*] on the Hindenburg and Alma varieties.

HENRY (A. W.). **Common Potato diseases and their control.**—*Circ. Coll. Agric. Alberta* 15, 25 pp., 8 figs., 1934. [Received April, 1935.]

Popular notes are given on the occurrence and control of some well-known fungal and virus diseases of potatoes in Alberta, Canada.

KAHO (H.). **Zur Physiologie der Kartoffel. I. Über die Permeabilität des Knollengewebes der vitalen und der abbaukranken Kartoffeln.** [Contribution to the physiology of the Potato. I. On the permeability of the tuber tissue of sound and degenerate Potatoes.]—*Phytopath. Z.*, viii, 2, pp. 157–164, 1935.

In order to determine the comparative permeability of the protoplasm of healthy potato tubers and those suffering from 'degeneration' in Esthonia in the form of mosaic, crinkle, and leaf roll, excised disks of tissue were laid in distilled water for given periods (up to 15 hours in the case of freshly dug material), at the end of which the exosmosis of the electrolytes was measured by electrical conductivity. The measurements showed that this exosmosis was generally greater in the diseased than in the healthy tubers. It was further shown by the so-called 'tissue tension method', involving the contraction of strips of tissue in a hypertonic solution, e.g., of saccharose (0·55 mol.) or calcium nitrate (0·28 mol.), that the cells of the diseased tubers have lower osmotic values than those of healthy ones [cf. *R.A.M.*, xi, p. 743]. From the response of the tissue strips to re-expansion in water it may be inferred that the cells of diseased tubers are more permeable to water than those of healthy ones.

BLACK (W.). **Studies on the inheritance of resistance to wart disease (Synchytrium endobioticum (Schilb.) Perc.) in Potatoes.**—*J. Genet.*, xxx, 1, pp. 127–146, 1935.

After a brief review of the literature dealing with inheritance of resistance in potatoes to wart disease (*Synchytrium endobioticum*), with particular reference to Lunden's and Jørstad's recent communication [*R.A.M.*, xiv, p. 251], the author gives a full tabulated account of his studies in Scotland on this problem since 1927. His results, with those reported by other workers, lead him to conclude that there are various kinds of resistant or tolerant and susceptible varieties, the differences being due to physiological properties governed by definite hereditary factors. The factors for resistance may not all possess similar powers and consequently do not contribute equally towards the natural resistance of a variety. Reaction to wart disease is believed to be explicable

on a more simple factorial basis than that assumed by other workers, and a three-factor scheme is presented which appears adequately to explain the observed facts. It is suggested that the reaction is controlled by three factor pairs, resistance being induced in the plant by the cumulative interaction of three factors designated A, B, C. Each of these is given a numerical value: A = 1, B = 2, and C = 3, which represents approximately their relative contributing power towards resistance. Sufficient resistance to overcome infection under field conditions is induced in plants in which the sum of the factorial values is seven or over. A plant heterozygous for all three factors is susceptible, the sum of its factorial values being only six. The numerical values assigned to genotypes correspond to phenotypic reaction in such a manner that the higher the value the more resistant is the phenotype.

A schedule is given showing the hypothetical genotypic constitution of resistant and susceptible varieties, together with the theoretical ratios in which these varieties should segregate when self-fertilized. This is followed by tables showing the actual segregations obtained from the self-fertilization of resistant and of susceptible potato varieties, together with the theoretical and expected ratios, from which the probable factorial constitution of the varieties is worked out.

CHAMBERLAIN (E. E.). **Fungi present in the stem-end of Potato tubers.**—*N.Z. J. Sci. Tech.*, xvi, 4, pp. 242-246, 1935.

Among the 1,475 fungus cultures isolated on potato-dextrose agar from the vascular bundles at the stem-ends of 1,201 out of 1,761 potato tubers tested at the Plant Research Station, Palmerston North, New Zealand, were 266 of *Fusarium orthoceras* [*R.A.M.*, xiii, p. 537], 246 of *Verticillium albo-atrum*, 60 of *Oospora pustulans*, 8 of *Corticium vagum* [*C. solani*], 5 of *Colletotrichum atramentarium*, and 4 of *Coniosporium arundinis* [ibid., x, p. 242]. Inoculation experiments with a number of the organisms showed that only *V. albo-atrum* was capable of causing wilt [see next abstract], while a dry rot of the tubers was induced by *F. orthoceras* and an unidentified species of *Fusarium*.

Corticium solani is prevalent throughout the Dominion as a pathogen of growing potato shoots. *O. pustulans* is responsible for a skin spot in Southland and to some extent in Canterbury. *Colletotrichum atramentarium* may be involved in the premature death of plants in Auckland but seems to do little damage elsewhere. The relative predominance of the various fungi was found to be influenced by the place of cultivation.

CHAMBERLAIN (E. E.). **Verticillium-wilt of Potatoes: its appearance, cause, and effect on yield.**—*N.Z. J. Agric.*, l, 2, pp. 86–91, 4 figs., 1935.

Briefly describing the symptoms of potato wilt and the life-history of its causal organism (*Verticillium albo-atrum*) [see preceding abstract], the author states that the disease was first recorded in New Zealand in 1931 [*R.A.M.*, x, p. 706; xii, p. 719]; it is now present in every potato-growing district in the country, and annually causes heavy losses. The Auckland Tall-top and Short-top varieties are very susceptible, over

30 per cent. infection having been observed on a crop of the former. In a test conducted at Palmerston North the disease reduced the yield by 50 per cent., and evidence was obtained that while all the tubers of an infected plant do not necessarily themselves become infected, the fungus may be present in tubers from apparently healthy plants which may have become infected through the soil late in the season.

BIRAGHI (A.). **Esperienze sulla formazione di sughero delle ferite in porzioni di tuberi di Patata irradiate con raggi ultra-violetti.** [Experiments on wound cork formation in portions of Potato tubers exposed to ultra-violet rays.]—*Boll. Staz. Pat. veg. Roma*, N.S., xiv, 4, pp. 492–502, 1 pl., 1934. [English summary.]

When cut halves of potato tubers were exposed to ultra-violet rays the superficial cells were killed, the necrosis being proportional to the duration of the exposure. When a conidial suspension of *Penicillium* sp. was placed on the cut surface of the exposed halves and of unexposed control halves, fungal growth was vigorous on the former and absent or scanty on the latter. Under the one or more layers of necrosed cells on the surfaces exposed to radiation there were a few layers of cells which did not form cork except when the fungus was added; under these were one or more layers in which phellogen was formed. The author gives reasons for holding that this deep cicatrization in irradiated uninoculated tubers is due to a change in the physiological balance of the constituents of the intermediate layers of cells between the necrosed layers and those that form cork.

DRECHSLER (C.). **Pythium scleroteichum n.sp. causing mottle necrosis of Sweetpotatoes.**—*J. agric. Res.*, xlix, 10, pp. 881–890, 2 pl., 1934.

In this paper the author gives a cultural and morphological description (with a Latin diagnosis) of *Pythium scleroteichum* (hitherto a *nomen nudum*) which, in a previous communication [*R.A.M.*, vi, p. 749], Harter & Whitney stated to be concerned, in association with *P. ultimum*, in the causation of mottle necrosis of sweet potatoes in the United States. In 1924, when mottle necrosis was more prevalent than usual in Maryland, Delaware, and Virginia, *P. ultimum* accounted for about 80 per cent. of the diseased specimens collected in Virginia, the rest yielding *P. scleroteichum* and an unidentified species of *Phytophthora* in about equal numbers. Since then, however, *P. scleroteichum* was found causing the disease alone in Virginia, Iowa, and Indiana.

In pure culture *P. scleroteichum* is characterized by a diffuse submerged mycelium consisting of hyphae mostly 2·5 to 7 μ broad, giving about 26 mm. radial growth in 24 hours at 24° C. Aerial mycelium is absent or scanty. The oogonia are terminal or (less frequently) intercalary, with a smooth wall 0·5 to 1·2 μ thick, subspherical, and 16 to 32 μ (average 23·8 μ) in diameter. The antheridia are regularly clavate, crooknecked, 9 to 16 by 4 to 7 μ, and usually 1 to 5 (average 3) to an oogonium; they are borne terminally or occasionally laterally on sometimes septate branches usually from a single, sometimes from two, parent hyphae, often constricted at intervals by abrupt, transverse furrows, and frequently, together with vegetative branches arising from them,

wrapped extensively and closely around the oogonium, making narrow or broad contact at the tip. They are mono- or diclinous. The oospores are distinctly yellowish, smooth, largely filling the oogonium, and measure 11 to 26 μ (average 18·7 μ) with a wall 0·8 to 1·4 μ thick. The zoosporangial stage of the fungus has not yet been obtained.

Bugnicourt (F.). **Principaux cryptogames parasites du Riz en Indochine et traitement à leur opposer.** [The principal cryptogamic parasites of Rice in Indo-China and the means of combating them.] —*Bull. écon. Indochine*, xxxvii, pp. 1320–1321, 1934.

The chief fungal parasites of rice in Indo-China are stated to be *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: *R.A.M.*, xiv, p. 221], *H. sigmoideum* [*Leptosphaeria salvinii*: ibid., xiv, p. 119], and *Brachysporium* sp. [ibid., xii, p. 146]. All may be effectively controlled by 24 hours' immersion of the seed-grain in 0·35 per cent. formaldehyde or 48 hours in a 0·2 per cent. solution.

Fukushi (T.). **Studies on the dwarf disease of Rice plant.**—*J. Fac. Agric. Hokkaido Univ.*, xxxvii, 2, pp. 41–164, 6 pl., 1 fig., 1934.

Much of the information in this comprehensive, fully tabulated account of rice dwarf in Japan has already been noticed from other sources [*R.A.M.*, xi, p. 324; xiii, pp. 261, 800], but attention may be drawn to the following new points. No inclusion bodies or micro-organisms of etiological significance, or visual evidence of the presence of the virus responsible for the disease, could be detected in the salivary glands, alimentary canal, egg follicles in the ovarian tubules, mycetome, or other organs of the viruliferous individuals of the insect vector, *Nephotettix apicalis* var. *cincticeps*. Infection is not transmissible through the soil or seed, nor could transmission be effected by mechanical inoculations with unfiltered juice of diseased plants or by means of leaf mutilation, while negative results were also given by the inoculation of healthy rice plants with the macerated tissues and body fluid of viruliferous leafhoppers.

It would appear that the eggs of the leafhopper are already infected at an early stage of their development in the ovaries and that some of the ova may escape infection. In most cases a period of 1 to 14 days is requisite after emergence from the egg before the newly hatched viruliferous nymphs can transmit infection, though certain individuals may be capable of doing so immediately on emergence. Further access to the virus is not usually necessary to maintain infectivity in the viruliferous nymphs throughout their entire adult life. The minimum period of feeding on a diseased plant required for the acquisition of the virus by a non-viruliferous leafhopper was found to be three days, but it was more freely absorbed in tests after 10 and after 50 days' feeding; certain individuals, however, still remained non-infective even after 50 or 70 days. The incubation period of the virus within the insect body apparently ranged from 10 to 40 days at 11° to 38° C.; in one case it was over two months at 14° to 32°.

Certain leafhoppers collected on *Astragalus sinicus* in rice-fields in the spring proved to be viruliferous, so that the virus apparently over-

winters in its insect vector, unless it can be definitely established that it survives in its various wild grass hosts or that *A. sinicus* harbours it during the winter without manifesting any signs of disease. All the evidence at present available indicates that the rice dwarf virus is autonomous, multiplying both in the insect body and in the plant tissues, and is in all probability a living entity of ultramicroscopic dimensions [cf. ibid., xiii, p. 588].

A bibliography of 238 titles is appended.

JACKS (G. V.) & SCHERBATOFF (Miss H.). **Soil deficiencies and plant diseases.**—*Tech. Commun. Bur. Soil. Sci., Harpenden,* 31, 48 pp., 1934.

This publication is stated to be intended as a non-critical guide to the literature of the subject, and consists of a brief digest of the most relevant facts abstracted from several hundred English and foreign papers dealing with pathological conditions in plants ascribed to deficiencies of the soil in the so-called minor elements, manganese, iron, magnesium, boron, sulphur, copper, and zinc. Descriptions of the symptoms of the various diseases are included, and there is a bibliography of 367 titles.

ZIEMIECKA (JADWIGA). **The use of a modified Rossi-Cholodny technic for studying the organisms that decompose certain organic compounds in soil.**—*Zbl. Bakt.*, Abt. 2, xci, 16–21, pp. 379–394, 15 figs., 1935.

Satisfactory results in the investigation of the stimulatory influence of twelve organic substances on microbiological activity in Polish garden and arable soils were obtained by Conn's modification of the Rossi-Cholodny direct examination technique [*R.A.M.*, xii, p. 324; xiv, p. 392].

EDGERTON (C. W.), TIMS (E. C.), & MILLS (P. J.). **Stubble deterioration of Sugar-Cane.**—*Bull. La Univ.* 256, 27 pp., 4 figs., 1934.

Deterioration of sugar-cane stubble (i.e. failure to produce a satisfactory number of vigorous ratoon shoots) has been one of the chief factors in the decline in the sugar industry in Louisiana, where it presents a more serious and complex problem than in the tropics because the cane is not harvested until winter has set in, so that the young shoots do not normally develop for several months. In addition to such factors as low temperature, poor drainage, and the like, red rot (*Colletotrichum falcatum*) has been found to be an important cause of this deterioration. The spores develop on the leaves and sometimes on the stalks, are washed down by the rains, and come into contact with the stubble pieces, which become infected in the nodal and bud regions and, to a slight extent, through the cut top surfaces. Many eyes are killed before they can germinate, and some of the shoots that emerge from the ground die off during the spring. The P.O.J. 213 and C.P. 807 varieties were found to be more susceptible to red rot than the other commercial varieties locally grown, and the former, together with P.O.J. 234, are

the two most seriously affected by stubble deterioration generally. The varieties at present commercially grown in Louisiana that have shown the greatest resistance to this trouble are Co. 281, Co. 29, and P.O.J. 36, while the new varieties C.P. 28–11, 28–19, and 29–320 also seem to be very resistant [cf. *R.A.M.*, xiii, p. 728].

McMartin (A.). **The Pineapple disease of Sugar Cane cuttings.**—*S. Afr. Sug. J.*, xix, 2, pp. 88–89, 1 fig., 1935.

A popular note is given on the pineapple disease of sugar-cane (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) [*R.A.M.*, x, p. 777], the occurrence of which in Natal has recently been detected.

Sydow (H.) & Mitter (J. H.). **Fungi indici—II.** [Indian fungi—II.]—*Ann. mycol., Berl.*, xxxiii, 1–2, pp. 46–71, 1935.

This second annotated list of 75 Indian fungi [cf. *R.A.M.*, xii, p. 395], containing 2 new genera and 17 new species furnished with Latin diagnoses, consists mainly of rusts and Ascomycetes with some Fungi Imperfecti. The records include *Mycosphaerella brassicicola* on cabbage leaves [ibid., xi, p. 558]; *Phomopsis artocarpi* n.sp., with slightly depressed-globose or often irregular, grey- to olivaceous-brown, epiphyllous pycnidia, 100 to 185 μ in diameter, and simple, subulate to lageniform conidiophores, 5 to 9 by 2 to 3 or 1 μ (base and apex, respectively), bearing copious oblong, subfusoid or clavate, inaequilateral or slightly curved, continuous, yellowish-pink (in the mass) conidia, 5 to 8 (occasionally 10) by 1·6 to 2·5 μ, producing scattered, amphigenous, irregular, chestnut-brown spots, 5 to 20 mm. in diameter, on the leaves of *Artocarpus integrifolia*; *Diplodia hibiscina* var. *sabdariffae* Sacc. on *Hibiscus sabdariffa* stems; and *Cercoseptoria balsaminae* n.sp., with small caespituli formed in and under the epidermis, 30 to 60 μ in diameter, erumpent, and bearing filiform, curved or occasionally suberect, hyaline, indistinctly septate conidia, 35 to 100 by 1·5 to 2·5 μ (at the base) on parallel rows of subulate to filiform, hyaline or subhyaline conidiophores, 6 to 12 by 2·5 to 3 μ (at the base); the fungus forms sparse, dirty yellowish-brown spots, 0·5 to 1 cm. in diameter, on *Impatiens balsamina* foliage.

Sydow (H.). **Fungi venezuelani—Additamentum.** [An addition to Venezuelan fungi.]—*Ann. mycol., Berl.*, xxxiii, 1–2, pp. 85–100, 1 fig., 1935.

Continuing his taxonomic studies on the fungi of Venezuela [cf. *R.A.M.*, ix, p. 684], the writer here enumerates a further 16, including 4 new genera and 8 new species with German and Latin diagnoses. Special interest attaches to *Scleroconium venezuelanum* n.g., n.sp., producing irregularly scattered, hypophyllous, more or less spherical, greyish-green tubercles, 1 to 3 mm. in diameter, on living leaves of *Xanthosoma sagittifolia*. The taxonomic position of this fungus is obscure; it is presumably a parasite, deriving nutriment from the faintly discernible hyphae in the mesophyll. A superficial tubercle is formed on the leaf surface by an outgrowth of the fungus (possibly through the stomata) and is composed of reticulately branched, hyaline hyphae,

2 to 4 μ in diameter and producing abundant clusters of botryose conidia, 5 to 7 by 3 to 4 μ, sessile or possibly on short sterigmata.

VAN BEYMA THOE KINGMA (F. H.). **Beschreibung einiger neuer Pilzarten aus dem Centraalbureau voor Schimmelcultures Baarn (Holland). III. Mitteilung.** [Description of some new species of fungi from the Centraalbureau voor Schimmelcultures, Baarn (Holland). Note III.]—*Zbl. Bakt.*, Abt. 2, xci, 16–21, pp. 345–355, 7 figs., 1935.

Morphological and cultural particulars and Latin diagnoses are given of the following new species of fungi identified by the writer at the Centralbureau voor Schimmelcultures [cf. *R.A.M.*, xiii, p. 333]; *Ceratostomella major* n.sp. from the air in the Unilever factory, Rotterdam; *Margarinomyces atrovirens* n.sp. (together with *M. bubáki*) [ibid., x, p. 107] from black spots in margarine (Unilever); *Isaria cretacea* n.sp. from a packet of yeast kept for some time under damp conditions in England; *Penicillium velutinum* n.sp. from sputum; and *Scopulariopsis nicotianae* n.sp. from a dried Nyasaland tobacco leaf received from Bristol.

SĂVULESCU (T.) & RAYSS (T.). **Quatrième contribution à la connaissance des Péronosporacées de Roumanie.** [Fourth contribution to the knowledge of the Peronosporaceae of Rumania.]—*Ann. mycol., Berl.*, xxxiii, 1–2, pp. 1–21, 10 figs., 8 graphs, 1935.

A list, supplemented by tables and by taxonomic and geographical notes, is given of 27 species of Peronosporaceae not included in foregoing compilations of this family in Rumania [cf. *R.A.M.*, xiii, p. 473], of which 6 are new and furnished with Latin diagnoses, bringing the present total for the country to 171 on 275 hosts.

YAMAMOTO (W.). **Cercospora-Arten aus Taiwan (Formosa) II.** [Species of *Cercospora* from Taiwan (Formosa) II.]—*J. Soc. trop. Agric. Taiwan*, vi, pp. 599–608, 4 figs., 1934.

Notes are given on 19 species (8 new, with Latin diagnoses) of *Cercospora* collected in Formosa during 1933–4 [cf. *R.A.M.*, xiii, p. 805]. Living leaves of *Althaea rosea* were attacked by *Cercospora althaeina* [ibid., xiv, p. 195], and those of *Eucalyptus globulus* by *C. epicoccoides*. *C. formosana* n.sp. is characterized by pale olivaceous, creeping, indistinctly septate hyphae, 2 to 3 μ in breadth, and simple, rarely sparsely branching, straight to subflexuous, continuous or 1- to 5-septate, brown conidiophores, 10 to 39 by 3·6 to 5 μ, bearing elongated to obclavate, straight or curved 3- to 15-septate, very faintly olivaceous conidia, 33 to 130 by 2 to 3·6 μ; it forms scattered, irregularly angular or suborbicular spots, 1 to 5 mm. in diameter, purplish-brown at first, paling gradually in the centre with a dark purple border, on living leaves of *Lantana mista* and *L. camara*. Living foliage of *Boehmeria frutescens* Thunb. var. *concoloris* Nakai develops irregularly scattered, angular, dark brownish or nearly black lesions, turning paler in the centre and becoming greyish-brown, 1 to 7 mm. in diameter, due to infection by *C. fukuii* n.sp., which is characterized by straight or subflexuous, pale olivaceous conidiophores, 16 to 62 by 3 to 4·3 μ, and cylindrical, nearly straight

or curved, very pale olivaceous, 3- to 14-septate conidia, 48 to 130 by 2 to 3 μ. *C. fukushiana* (Mats.) comb. nov. [ibid., viii, p. 447] forms irregularly scattered, orbicular or suborbicular, brown, later pale ochraceous or whitish, often brown- or red-bordered spots, 1 to 5 mm. in diameter, on living leaves of *Impatiens balsamina*; it is characterized by straight or flexuous, mostly simple, light brown conidiophores, 1- to 4-septate, 23 to 113 by 4·3 to 6 μ, and by acicular, sometimes elongated to obclavate, straight or slightly curved, 3- to 21-septate, hyaline conidia, 20 to 125 by 3 to 3·6 μ. Living *Dahlia variabilis* foliage is liable to infection by *C. grandissima* [ibid., vii, p. 765]. Large (5 to 30 mm. in diameter), orbicular or suborbicular lesions, yellowish- to dirty brown, turning grey or greyish-yellow, often surrounded by a yellowish-green, later dark purplish-brown zone, are formed on living leaves of *Ixora chinensis* by *C. ixorae* n.sp., which has densely aggregated, mostly simple, straight or sinuous, continuous or 1- to 4-septate, pale olivaceous-brown conidiophores, 16 to 46 by 3 to 4·3 μ, and cylindrical, 2- to 8-septate, very pale olivaceous conidia, 29 to 73 by 2 to 3 μ. Living lettuce foliage is attacked by *C. longissima* [ibid., ix, p. 230], and that of mango by *C. mangiferae*. *Nerium indicum* leaves are liable to infection by *C. nerii-indici* n.sp., producing subangular or irregular, yellowish-green, later yellowish-brown, ashen, or black-olivaceous, more or less effuse, often confluent lesions; the conidiophores are simple or branched, curved, denticulate above, 1- to pluriseptate, pale olivaceous-brown, and bear cylindrical or obclavate-cylindrical, straight or slightly curved, 1- to 11-septate, pale olivaceous conidia, 26 to 107 by 3 to 4·3 μ. Guava leaves are attacked by *C. sawadae* nom. nov. (= *C. psidii* Sawada (non Rangel) in Shirai & Hara: A list of Japanese Fungi, p. 72, 1927); and those of *Dioscorea alata* by *C. ubi* Rac.

MITRA (A.). **A study of certain Fusaria.**—*J. Indian bot. Soc.*, xiii, 4, pp. 255–268, 2 pl., 8 graphs, 1934.

Particulars are given of the writer's studies at Allahabad, India, on the comparative behaviour of six species of *Fusarium* on four standard media: *F. viride* (*F. solani* var. *medium*), newly reported as a parasite of potatoes [*R.A.M.*, xiii, p. 394] and experimentally shown to be pathogenic to apples, *F. camptoceras* isolated from *Pennisetum typhoideum*, and *F. moniliforme* [*Gibberella moniliformis*], isolated from a dead sorghum leaf sheath and proved capable of attacking apples [ibid., xiv, p. 242], made no better growth on media prepared from their own hosts than on the other substrata used. *F. diversisporum* and *F. incarnatum* (*F. semitectum* var. *majus*) produced little or no aerial mycelium on apple agar. Saltation in the form of sectors was observed in *F. solani* var. *medium* and *F. semitectum* from *Citrus medica* [loc. cit.], the mutants differing from their parents in linear rate of spread, aerial mycelium, coloration of the substratum, average septation, spore dimensions, and chlamydospore development. *F. solani* var. *medium* was the only species that produced both mycelial and conidial chlamydospores. The marked variability of the six forms studied, either as a response to cultural modifications or in the form of saltation, suggests that such temporary changes may be largely responsible for the great number of species recorded in the genus.

VAN DER WEIJ (H. G.). **Ziekten der Tabak.** *Ex* **Overzicht van de ziekten en plagen der Deli-Tabak in het jaar 1934.** [Tobacco diseases. *Ex* Report on the diseases and pests of Deli Tobacco in the year 1934.] —*Meded. Deli-Proefst.*, Ser. II, xci, pp. 4–11, 1935.

Very brief notes are given on the prevalence in Medan, Sumatra, during 1934 of the following parasitic diseases of tobacco: slime disease (*Bacterium solanacearum*), black rust (*Bacterium pseudozoogloeae*), top rot (*Bact.* [*Bacillus*] *aroideae*), *Phytophthora* [*parasitica*] *nicotianae* [*R.A.M.*, xii, p. 471], stem scorch (*Pythium*) [*aphanidermatum*, *P. myriotylum*, and *P. deliense*: ibid., xiii, p. 475], leaf scorch (*Cercospora nicotianae*), and the virus diseases mosaic ('peh sim'), Rotterdam B disease, 'gilah', 'korab', and 'daon lidah' [ibid., xiii, p. 328]. Some non-parasitic disorders are also mentioned.

HOGGAN (ISMÉ A.). **Transmissibility by aphids of the Tobacco mosaic virus from different hosts.**—*J. agric. Res.*, xlix, 12, pp. 1135–1142, 1934.

In continuation of her studies of the transmission of virus diseases by aphids to tobacco [*R.A.M.*, xiii, p. 331], the author gives an account of experiments from 1930 to 1934, inclusive, in which she tested the transmissibility of Johnson's tobacco virus No. 1 [ibid., xiv, p. 261] by *Macrosiphum solanifolii* [*M. gei*], *Myzus persicae*, and *M. pseudosolani* from various Solanaceous and other hosts to tobacco. The results [which are tabulated] showed that the virus was transmitted with some regularity from tomato and *Lycopersicum pimpinellifolium*, but only occasionally from eight other hosts tested, while no evidence of transmission was obtained from the remainder. In general, the greatest amount of infection from any host was effected by *Macrosiphum gei*, and the least by *Myzus persicae*. Only two cases of transmission from tobacco to tobacco were obtained. In parallel tests comparatively high percentages of transmission of the cucumber mosaic virus [ibid., xiv, p. 143] to tobacco were obtained from all the hosts tested, including *L. pimpinellifolium*, *Solanum nigrum* var. *guineense*, *Nicandra physaloides*, *Physalis longifolia*, *P. heterophylla*, *Cynoglossum amabile*, *Zinnia elegans*, and *Phacelia whitlavia*, which are stated to be new records as hosts of the cucumber mosaic virus.

By using *Nicotiana tabacum* × *N. glutinosa* hybrids, which develop local necrotic lesions on the leaves at the points of infection with tobacco mosaic, it was estimated that with *Macrosiphum gei* about 1 aphid in 140, with *Myzus pseudosolani* 1 aphid in 129, and with *M. persicae* about 1 aphid in 800 or more is infective and able to introduce the virus into the host, while comparative experiments indicated that 1 *M. persicae* individual in 4 or 5 acted as a vector of a crucifer mosaic virus (an account of which is in the press), and transmitted sugar beet mosaic virus [ibid., xiv, p. 342] to tobacco.

The results of these investigations suggest that the more common aphids are probably not concerned in the dissemination to any appreciable amount of tobacco mosaic, except perhaps from the tomato, and it is doubtful whether even this can account for much of the sporadic infection which occurs on tobacco in the field.

SPENCER (E. L.). **Effect of nitrogen supply on host susceptibility to virus infection.**—*Phytopathology*, xxv, 2, pp. 178–191, 2 figs., 3 graphs, 1935.

In a study of the effect of nitrogen supply on host susceptibility to virus infection, Turkish tobacco plants grown in soil at different nitrogen levels were inoculated with yellow tobacco mosaic virus (Johnson's tobacco virus 6) [*R.A.M.*, xiv, p. 385], susceptibility being measured by Holmes's pin puncture method [ibid., vii, p. 477; viii, p. 138]. *Nicotiana glutinosa* plants grown under similar conditions were inoculated with the ordinary green tobacco mosaic virus (Johnson's No. 1) [ibid., xiv, p. 261]. Early Golden Cluster beans (*Phaseolus vulgaris*) were grown at various nitrogen levels in sand cultures and inoculated by rubbing the leaves with the green tobacco mosaic virus, susceptibility being gauged by the average number of primary lesions per leaf.

Conclusive evidence was obtained from the three hosts of a definite correlation between plant nutrition and susceptibility to virus infection, the latter being governed not so much by host vigour as expressed in growth rate as by some other limiting factor of a nature so far unknown. However, plants making the most rapid growth were considerably less susceptible than those in which development was retarded by an excess of nitrogen. In tobacco the susceptibility of all the leaves on a plant is altered by changing the nitrogen level. At any nitrogen level the upper leaves are the most susceptible, followed by the middle ones.

HOPKINS (J. C. F.). **Mycological notes. Seasonal notes on Tobacco diseases. 8. The mosaic mystery. 9. Danger points in field spraying.** —*Rhod. agric. J.*, xxxii, 2, pp. 108–113, 1935.

In the first note the author aims at dispelling the mystery which tends to enshroud the problem of tobacco mosaic in the mind of the Rhodesian tobacco-growers, and points out that the rather alarming amount of the disease which existed in some districts in 1934 was chiefly due to their ignoring or misinterpreting the recommendations for the control of the trouble published in 1931 by the Department of Agriculture [*R.A.M.*, xi, p. 206].

In the second note he gives some practical advice for the correct field spraying of tobacco with Bordeaux mixture, based on his recent recommendations [ibid., xiv, p. 200].

GHIMPU (V.). **Afecțiunile fiziologice ale Tutunului.** [Physiological disorders of Tobacco.]—*Bul. Cultiv. Ferment. Tutun.*, xxiii, 2, pp. 164–173, 1934.

A review is given of some of the more important recent literature on the physiological disorders of tobacco associated with excess or deficiency of the basic nutrient elements. Reference to most of the work referred to has been made from time to time in this *Review*.

VAN SCHREVEN (D. A.). **Uitwendige en inwendige symptomen van boriumgebrek bij Tomaat.** [External and internal symptoms of boron deficiency in Tomato.]—*Tijdschr. PlZiekt.*, xli, 1, pp. 1–26, 3 pl., 1935. [English summary.]

Using the same technique as already described in connexion with his

investigations on boron deficiency in tobacco [*R.A.M.*, xiii, p. 600], the writer carried out a series of observations on a similar phenomenon in Ailsa Craig tomato plants in water and glass-sand cultures [cf. ibid., xiv, p. 141]. The typical external and internal symptoms of the disorder, including death of the growing points of roots and stems, leading to secondary root and axillary bud production, leaf curl, chlorosis, thickening of the foliar tissue, and extensive degeneration of the cambium, phloem, and parenchyma, developed both in plants grown without boron and in those first supplied with an adequate quantity of boric acid and then deprived of it. The condition was found to be curable by the addition to the nutrient solution of 0·0005 gm. boric acid per l.

TISDALE (W. B.) & HAWKINS (S.). **Control of Phoma rot of Tomatoes.** —*Pr. Bull. Fla agric. Exp. Sta.* 467, 2 pp., 1934.

After a very brief reference to the symptoms caused by *Phoma destructiva* [*R.A.M.*, xiv, p. 263] on tomatoes and to its economic importance in Florida, the authors state that the disease can be controlled by spraying with 2–2–50 Bordeaux mixture at intervals determined by weather conditions. This treatment should be supplemented, however, to prevent the development of fruit rot in stored tomatoes, by dipping the fruit, preferably immediately after picking, in a fungicide. Of the materials so far tested for this purpose, 5 per cent. borax solution, and a special, highly concentrated commercial mixture containing sulphur in the form of sodium polysulphides and sodium thiosulphates (sulfocide), at the rate of 1 gall. of the concentrate to 150 galls. water, have been found to be the most effective and not to injure the keeping qualities of the fruit. The borax treatment is more effective when the temperature of the solution is kept at 100° F. The addition of 2 lb. tar soap (liquid or in flakes) to 50 galls. of the solutions is recommended to increase their adhesive properties. This treatment was also shown to prevent a large percentage of decay in fruits from non-sprayed fields, but is less effective than a combination of spraying in the field and disinfection of the fruit after picking.

RAABE (A.) & SENGBUSCH (R. v.). **Zur Physiologie von Cladosporium fulvum.** [A contribution to the physiology of *Cladosporium fulvum*.] —*Gartenbauwiss.*, ix, 3, pp. 183–188, 2 figs., 1935.

M. Schmidt and his collaborators (including the second-named writer) are stated to have confused *Cladosporium fulvum*, the causal organism of tomato leaf mould [*R.A.M.*, xiii, p. 133], with *Trichothecium roseum*, a facultative parasite of all kinds of plant material which accompanied *C. fulvum* on the tomato leaves used. Their statements as to the influence of tomato decoction and solanin on germination and growth form of the germ-tubes are therefore applicable to *T. roseum* and not to *C. fulvum*. The latter was found to be readily cultivable on a medium consisting of 1 and 10 parts (by weight), respectively, of fresh tomato foliage and water, boiled for 5 to 10 minutes, and 2 per cent. agar, while biomalt agar (2·5 per cent.) also gave very satisfactory results. Slow growth and cushion-shaped, pale to olive-brown colonies are characteristic of *C. fulvum* on agar cultures. Conidiophores and conidia do not differ in any respect from those observed in nature. Inoculation

experiments with spore suspensions of the fungus from agar cultures gave positive results on Bonny Best tomato leaves.

BAVENDAMM (W.). **Bemerkenswerte pilzliche Krankheiten des letzten Jahres.** [Remarkable fungous diseases of the last year.]—*Mitt. dtsch. dendrol. Ges.*, xli (*Jb.*), pp. 180–181, 2 figs., 1934.

After a discussion of the pine disease caused by *Cenangium abietis* [*R.A.M.*, xii, p. 667], which is reported to have attacked especially 40- to 60-year-old stands with extreme severity in Germany during 1934, the author briefly describes the bark blight of oaks due to *Dothidea noxia* Ruhl. [ibid., viii, p. 347]. Affected trees show a brownish discoloration of the cortex, most pronounced near or surrounding branch stumps; the lesions, small at first, gradually expand until the whole branch or trunk, as the case may be, is girdled, and simultaneously extend longitudinally so that the upper part or even the whole tree is killed. Young trees (from 2 to 18 years old) are most liable to infection by *D. noxia*, the pycnidial stage of which, *Fusicoccum noxium*, is characterized by simple, hyaline conidia, 12·4 to 15 by 4 to 5·5 μ, and the perithecial form having hyaline ascospores measuring 18·6 to 22 by 4·5 to 6 μ. The fungus, a wound parasite, is capable of causing extensive damage and is not always amenable to control even by drastic pruning. Not only native but American red oaks (*Quercus rubra*) have been found susceptible to bark blight.

CLINTON (G. P.) & MCCORMICK (F[LORENCE] A.). **The Dutch Elm disease, Graphium ulmi, in Connecticut.**—*Science*, N.S., lxxxi, 2090, pp. 68–70, 1935.

Notes are given on the present distribution of Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) in Connecticut [*R.A.M.*, xiv, p. 406], where over 50 infected trees have been found, the majority in Fairfield County but one some 50 miles distant at Old Lyme. The European beetle carriers of the disease (*Scolytus scolytus*, *S. multistriatus*, and *S. sulcifrons*) were not detected near Old Lyme, but the native beetle *Hylurgopinus rufipes* and mites were found and shown to be capable of conveying the spores of the fungus [ibid., xiv, p. 63]. The writers believe that the time is now past when either the fungus or its insect carriers can be eradicated in the United States.

Ein Mittel gegen das Ulmensterben. [A remedy against the dying-off of Elms.]—*Öst. Vjschr. Forstw.*, N.F., liii, 1, pp. 12–13, 1935.

Writing recently in *Der deutsche Forstwirt*, Freiherr von Ascheberg reports an apparently complete cure of sixty-six elms suffering from dying-off [*Ceratostomella ulmi*] at Mersch [Westphalia], Germany [*R.A.M.*, xiv, p. 264], by means of injections of fruit-tree carbolineum [ibid., xiii, p. 316 *et passim*] applied through holes (four per tree) pierced obliquely through the bark to a depth of 10 cm. and at a height of 10 cm. above soil level, the treatments being given two years running in March–April and again in June–July.

MILLER (P. W.). **Studies on the control of Walnut blight in Oregon.**— *Rep. Ore. hort. Soc. 1934*, pp. 105–121, 1935.

Further commercial spraying tests against walnut blight (*Bacterium juglandis*) [*R.A.M.*, xiv, p. 204] in grafted orchards confirmed the results obtained in previous experiments [ibid., xiii, p. 409], and indicated that at least two applications of Bordeaux mixture (2–2–50) are necessary to give satisfactory control in an average season in western Oregon. They should be made very shortly before most of the pistillate flowers come into full bloom and again after most of them have been pollinated, i.e., after about two weeks. A summer oil emulsion or a light medium spray oil may be added at the rate of 1 in 100 parts to the first application to reduce injury to the foliage. A third treatment about ten days after the second may be necessary if much rain falls during the month or six weeks after blossoming. The chief factor in the success or failure of this programme is the correct timing of the applications.

MILLER (P. W.). **Walnut blight and its control in the Pacific Northwest.** —*Circ. U.S. Dep. Agric.* 331, 14 pp., 8 figs., 1934.

A brief, popular account is given of the most essential information at present available on walnut blight (*Bacterium juglandis*) and its control by spraying [see preceding abstract] in western Oregon. In 1933, the disease caused losses in the Pacific Northwest amounting to approximately 35 per cent. of the crop.

VARADARAJA IYENGAR (A. V.). **Contributions to the study of spike-disease of Sandal (Santalum album, Linn.). Part XVI. Distribution of arsenic in Sandal-wood treated with sodium arsenite.**—*J. Indian Inst. Sci.*, xviiA, 12, pp. 131–139, 1935.

In spiked sandal (*Santalum album*) plants [*R.A.M.*, xiv, p. 265] treated for eradication by girdling and applying to the exposed wood a solution of sodium arsenite [ibid., xii, p. 129] in the Bangalore district of India, large quantities of the poison were detected in the bark and sapwood, while movement of the substance was even noticed in the roots at some distance from the point of application. The root-suckers of treated plants may also be reached and killed out by the solution. Notwithstanding the presence of traces of arsenic in the heartwood of treated plants, no poison was detected in the oil thence derived by any method of extraction, so that this mode of eradication of the diseased trees does not interfere with the commercial utilization of the wood. Death of the sandal plants appears to be due to inhibition of nutrition due to killing by the arsenic of the tissues near the girdled parts.

SRINIVASAN (M.) & SRINIVASAYA (M.). **Contributions to the study of spike-disease of Sandal (Santalum album, Linn.). Part XVII. Hydrogen-ion concentration and buffering capacity as factors of disease resistance.**—*J. Indian Inst. Sci.*, xviiA, 14, pp. 153–164, 6 graphs, 1935.

The initial acidity and buffering capacities of spiked sandal (*Santalum album*) [see preceding abstract] tissue fluids were found to be higher than those of healthy ones. The gradient in reaction in decreasing order is

leaf, bark, wood, and root. Tissue fluids of sandal grown in combination with *Ruta graveolens*, *Murraya koenigii*, *Melia azedarach*, and *Toddalia aculeata*—hosts imparting relative immunity to the sandal trees parasitic on their roots—are more buffered than those from sandal trees which obtain their nutrition from haustoria on *Acacia farnesiana* or are deprived of any host, in both of which cases susceptibility to spike is extreme [cf. *R.A.M.*, xi, p. 82]. A significant correlation would thus appear to exist between disease resistance and the buffering capacities of the tissue fluids of sandal grown with different hosts.

DELEVOY (G.) & BOUDRU (M.). **Note sur le chancre du Peuplier.** [A note on Poplar canker.]—*Bull. Soc. for. Belg.*, xlii, 1, pp. 1–10, 1935.

After discussing at some length the recent papers by Day and Peace on poplar canker [*R.A.M.*, xiii, p. 408] and the part played by frost injury in the inception of the disease [ibid., xiii, p. 484], the authors state that one canker examined at Gembloux showed the presence of *Cylindrocarpon willkommii* [*Nectria ditissima*: ibid., vii, pp. 676, 677] and also a *Cytospora* and a *Valsa*. Inoculations with these three fungi gave rise to a canker from which they were all re-isolated.

Observations in Belgium confirmed the view that predisposition to canker varies with the type of poplar and the locality. Twenty-seven species and varieties of poplar were planted by the Belgian forestry experimental service in three localities with different soils, and the subsequent development of the disease showed quite clearly that the susceptible kinds of poplar were those with long turions and red or reddish petioles. The slowly growing types of poplar proved to have a greater predisposition to canker than those that grow rapidly. It appears that when selecting poplars for planting purposes preference should be given to the kinds that shed their leaves late and have green (not yellow) or only faintly coloured turions and petioles.

SCHEFFER-BOICHORST. **Pappelkrebs.** [Poplar canker.]—*Mitt. dtsch. dendrol. Ges.*, xli (*Jb.*), p. 181, 1934.

At the instance of the mycological department of the Forestry Institute, Hann.-Münden, the poplar stands of Velen, Westphalia, were visited in 1934 by Dr. J. Ehrlich of Harvard University, who found that the trees were attacked in epidemic form by *Nectria coccinea* var. *sanguinella* [*R.A.M.*, xiii, p. 479] and agrees with the German silvicultural authorities that the further cultivation of poplars in this district, pending the development of a canker-resistant variety, would be a grave error of judgement.

SERVAZZI (O.). **Contributi alla patologia dei Pioppi. I. La 'fillostictosi' del Pioppo nero e del Pioppo del Canadà.** [Contributions to the pathology of Poplars. I. 'Phyllostictosis' of Lombardy and Canadian Poplars.]—*Difesa Piante*, xi, 6, pp. 185–207, 4 figs., 1934.

Investigations [which are fully described] into the leaf spot of *Populus nigra* and *P. canadensis* caused in Italy by *Phyllosticta populina* Sacc. showed that in culture there were great variations [which are described] in the size and shape of the pycnidia and pycnospores, according to the medium used. Artificial inoculations of young wounded leaves gave

positive results, the infected area remaining limited, however, on adult wounded leaves. Infection was obtained more readily on *P. canadensis* than on *P. nigra*. No infection occurred on unwounded leaves or leaves kept in the dark. The maximum, minimum, and optimum temperatures for infection were, respectively, 30° to 33°, 8°, and about 18° to 20° C.

Normally, the disease does not cause serious damage, but in seasons unfavourable to the host great reduction of the leaf surface may result, especially when infection takes place in spring, while the leaves are still tender, in which case the vitality of one- to two-year-old seedlings in nurseries may be much impaired.

The aberrant forms observed in culture did not reappear on the host in inoculation tests, though the fungus showed a certain amount of variation even in natural conditions.

In view of these facts and the slight diagnostic differences between *P. populina*, *P. alcides* Sacc., *P. cinerea* Pass., and *P. prominens* Oud., the author considers that all these should be regarded as a single species, under the first name.

BROOKS (F. T.) & WALKER (M. M.). **Observations on Fusicladium saliciperdum.**—*New Phytol.*, xxxiv, 1, pp. 64–67, 1 fig., 1935.

Willows, especially *Salix fragilis* var. *decipiens*, in the Cambridge district have been liable of recent years to infection by *Fusicladium saliciperdum* [*Venturia chlorospora*: *R.A.M.*, xiii, p. 596] which causes blackening of the leaves and young twigs and almost complete defoliation before midsummer in a wet season. Cankers may be formed on the stems where the disease is arrested by dry conditions. The fungus overwinters in the dead twigs, on which sporulating pustules have been found just before the spring infection of the leaves. Inoculation experiments with *F. saliciperdum* spores on uninjured young plants of *S. fragilis* var. *decipiens* in May, 1934, gave positive results after an incubation period of eleven days, indicating the truly parasitic character of the fungus. This is in opposition to the observations of Nattrass and Dennis [ibid., xi, p. 214]. The blackening closely followed the line of the midrib towards the petiole which soon became involved, infection sometimes spreading also into the stem. The pustules of the fungus developed in profusion along the lines of the veins on the lower leaf surface. The rapid extension of the black discoloration may be due either to the secretion of some product by the invaded host cells or to a toxic element derived from the fungus.

The symptoms of the disease caused by *F. saliciperdum* are practically indistinguishable from those of *Physalospora miyabeana* [loc. cit.]. It would appear that the former is responsible for the infection of willows in the Cambridge area, while the latter is the usual, possibly the invariable, cause of the virtually identical disease in the Long Ashton, Bristol, district.

BOUDRU (M.). **La thérapeutique interne chez les végétaux. Perspectives d'utilisation pratique.** [Internal therapeutics in plants. Prospects of practical application.]—*Bull. Soc. for. Belg.*, xlii, 2, pp. 73–80, 1935.

After a general discussion of the various methods suggested by previous workers for treating plant diseases by internal therapeutics,

especially as applied to trees [*R.A.M.*, xiii, p. 641 *et passim*], the author emphasizes the necessity of using solutions with a favourable chemotherapeutic index [ibid., v, p. 619]. The method favoured by him is to cut branches of the plant affected, either herbaceous or woody, immersed in the solution; the best time to effect this treatment is spring and summer. In tests on the elder [*Sambucus nigra*] he determined the exact *dosis tolerata* for a number of solutions, and states that some of them behaved like water in regard to their diffusion through the cell walls. By a careful selection of the absorbing points a regular distribution of the curative substance may be attained throughout the whole plant. The paper terminates with a very brief discussion of the application of the solutions through the soil.

Bugnicourt (F.). **Contribution à l'étude du Sphaerostilbe repens B. et Br.** [A contribution to the study of *Sphaerostilbe repens* B. et Br.]—*Bull. écon. Indochine*, xxxvii, pp. 1321–1322, 1934.

Sphaerostilbe repens [*R.A.M.*, xii, pp. 21, 77, 207; xiii, p. 216] is stated to have been identified for the first time in Indo-China in July, 1934, on *Aleurites montana*, which it attacks in a virulent form, generally causing the death of the host shortly after the first appearance of the external symptoms of infection. No support is lent by the results of physico-chemical studies to the view that soil conditions are partially responsible for outbreaks of the disease, and the author considers that direct measures are absolutely essential to combat this formidable pest of tea and rubber plantations.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, ix, 2, pp. 37–40, 1935.

Spain. A Decree, dated 13th October, 1934, of the Presidency of the Council of Ministers, enforces the phytopathological inspection of Spanish oranges and other citrus fruits destined for foreign markets with a view to the exclusion from export of material infected by *Pleosphaeria* [*Limacinia*] *citri* [*R.A.M.*, iii, p. 211; vi, p. 92; x, p. 492] or other fungal and insect pests.

France. A Presidential Decree of 12th October, 1934, authorizes the Commissioner of the Republic in the territory of Cameroon to issue, with expert advice, orders enforcing the removal from plantations and destruction of diseased plants or plant parts and the application of disinfectants where necessary.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Dutch Elm disease quarantine (domestic). Notice of Quarantine No. 71, with regulations.—*U.S. Dep. Agric. Off. Inform. Pr. Serv.*, 4 pp., 1935. [Mimeographed.]

The terms of Quarantine No. 71, effective as from 25th February, 1935, prohibit the inter-State movement from certain [specified] areas in New Jersey, New York, and Connecticut of any or all parts of elms of every species, with the exception of timber or products manufactured from or containing elm wood, in order to prevent the further spread of Dutch elm disease (*Ceratostomella ulmi*) [see above, p. 476].

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW

OF

APPLIED MYCOLOGY

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MOWRY (H.) & CAMP (A. F.). **A preliminary report on zinc sulphate as a corrective for bronzing of Tung trees.**—*Bull. Fla agric. Exp. Sta.* 273, 34 pp., 7 figs., 1934. [Received May, 1935.]

The preliminary results are reported of experiments started in 1931 for the control of an unthrifty condition (locally known as 'bronzing') of the tung tree (*Aleurites fordii*) which of recent years has become increasingly prevalent and troublesome under certain soil conditions in Florida. The first visible symptom of the trouble is a bronze discoloration of a few or many leaves, coupled with a deformation of the terminal ones which may be very slight or extremely severe; progressively the foliage acquires a typical dark bronze colour and parts of the laminae die, giving the leaves a ragged appearance. The new leaves become more severely affected, being smaller and badly malformed, and the internodes are shortened, imparting a bunched appearance to the growth. During the first season the trouble may appear on one branch only, which may be badly affected before the symptoms appear on the others, but eventually the whole tree becomes involved.

Remarkable recovery of many severely affected trees was effected by applications to the soil of monohydrated zinc sulphate at the rate of $\frac{1}{4}$ to $\frac{1}{2}$ lb. per tree, or by spraying them with 5–5–50 zinc sulphate-lime mixture.

There was also clear evidence that bronzing of the tung tree is not an isolated trouble peculiar to the crop, since Satsuma oranges in a plot adjoining a badly bronzed lot of tung trees showed a consistent and severe chlorosis (frenching) [*R.A.M.*, xiv, p. 441] which responded to zinc treatment. Marked chlorosis and stunting were also observed in a row of *A. montana* sown in 1933 in a nursery along with several rows of *A. fordii* and were remedied by zinc sulphate at the rate of 1 lb. per hundred feet of row.

HAVELIK (K.). **Odumíráni Jedle.** [The dying-off of the Fir.]—*Ann. Acad. tchécosl. Agric.*, x, 1, pp. 124–128, 1935. [German summary.]

The author gives a brief account of field observations and histological studies which indicate that the serious and widespread dying-off of the silver fir [*Abies pectinata*: *R.A.M.*, vii, p. 350] which has of recent times become increasingly prevalent in central Europe, particularly in Czecho-Slovakia, Germany, and Poland, is chiefly due to the modern tendency

of creating pure stand forests clear of undergrowth. This practice is especially injurious to the fir, the cortical tissues of which are comparatively delicate and sensitive to sun scorch, particularly after frost. He considers that this tree should only be grown mixed with broad-leaved species, preferably beeches, and should never be planted on southern slopes or in sites exposed to direct sunshine.

HUBERT (E. E.). **Observations on Tuberculina maxima, a parasite of Cronartium ribicola.**—*Phytopathology*, xxv, 2, pp. 253–261, 2 figs., 1935.

Between 1917 and 1932 the following rusts have been found to be parasitized by *Tuberculina maxima* [*R.A.M.*, xii, p. 543] in the United States: *Cronartium coleosporioides*, *C. pyriforme*, *C. cerebrum*, *C. ribicola* [ibid., x, p. 698], and *Uredinopsis mirabilis*. In 1931 the writer obtained from Germany a large supply of spores of *T. maxima* with which inoculation experiments on *C. ribicola* cankers on white pine (*Pinus strobus*) were carried out at two localities in Idaho. The results of these tests were negative, as also were most of those subsequently made in 1931–2 with British Columbian material. The few positive data secured in these experiments indicate that the fungus is capable of establishing itself and spreading to a very limited extent, but its potentialities as an agent of rust control would appear to be inconsiderable.

ROTH (C.). **Untersuchungen über den Wurzelbrand der Fichte (Picea excelsa Link).** [Studies on the root scorch of the Spruce (*Picea excelsa* Link).]—*Phytopath. Z.*, viii, 1, pp. 1–110, 2 figs., 4 diags., 34 graphs, 1935.

In this exhaustive, fully tabulated account of his observations on spruce (*Picea excelsa*) nursery root scorch in Switzerland, which are stated to cover much the same troubles as those discussed by Hartley in the United States ('Damping-off in forest nurseries', 1921), the writer follows the latter in his differentiation of three forms of the disease, i.e., germination loss and normal and late damping-off [cf. *R.A.M.*, x, p. 569].

Pure cultures of *Pythium de Baryanum* [ibid., vii, p. 685], *Fusarium bulbigenum* var. *blasticola* [ibid., xiv, p. 256], *F. moniliforme* [*Gibberella moniliformis*], and *Rhizoctonia solani* (which is considered to be the imperfect stage of *Corticium vagum* B. et C.) [ibid., xiv, p. 258] were isolated from the diseased plants. The fungi were found to be strongly influenced by environmental conditions. Of the two most virulent of the parasites concerned, *C. vagum* is more susceptible than *P. de Baryanum* to extremes of temperature, both high and low, and of acidity and alkalinity; it is also less aggressive below soil level and thus relatively unimportant as a source of germination loss. The damping-off fungi function most actively at a temperature range of 18° to 30° C., above which *C. vagum* becomes entirely innocuous though *P. de Baryanum* is still pathogenic at 33°. No appreciable damage is caused by the two species of *Fusarium* investigated except under the protracted influence of temperatures between 24° and 33°. Since the host attains its maximum development at about 33° the seedlings can only be protected to a limited extent by cultivation at temperatures above the optimum for the para-

sites. The spruce being very sensitive to alkalinity, growth at a P_H range from 4·2 to 5·0 is indicated as at once favourable to the host and adverse to its pathogens. *P. de Baryanum* and *C. vagum* both suffer from extreme moisture and excessive dryness of the soil (100 and 50 per cent., respectively, of the water-holding capacity), the result being expressed in the former by decline of growth and in the latter by diminution of virulence.

In widespread outbreaks of an unidentified *Fusarium* on five-month-old seedlings (late damping-off) in experimental plantings and nursery gardens of eastern Switzerland in 1930, a correlation was established between density of planting and infection, the incidence of which was highest in the sparsely occupied portions of the stand and lowest in the crowded ones.

A bibliography of sixty-nine titles is appended.

Van Vloten (H.). **Wie wird die Rhabdoclineschütte der Douglasien verbreitet?** [How is *Rhabdocline* leaf fall of Douglas firs disseminated?] —*Forstl. Wschr. Silva*, xxiii, 3, pp. 17–18, 1935.

The writer emphasizes and amplifies his previous assertions in support of the view that the leaf fall of disease of Douglas firs [*Pseudotsuga taxifolia*] due to *Rhabdocline pseudotsugae* [*R.A.M.*, xiii, pp. 554, 607] was introduced into Holland from Germany. The question of long-distance transport of the ascospores requires further investigation, but proof has been obtained that 5·6 per cent. of the four-year-old Douglas firs (var. *caesia*) from a well-known north German forest nursery were infected by the disease on arrival in Holland in the autumn of 1934.

Briefly replying to this contention, T. Rohde (pp. 18–19) points out that England is the most likely source of long-distance infection by *R. pseudotsugae*. Further debate as to whether the disease first appeared in Germany or Holland is regarded as pointless owing to the absence of exact information concerning the latter country.

Prodan (I.). **Diplodia pinea (Desm.) Kickx in Rumänien.** [*Diplodia pinea* (Desm.) Kickx in Rumania.]—*Bul. Inf. Grăd. bot. Cluj*, xiv (*1934*), 3–4, pp. 240–243, 4 figs., 1935.

The needles of old pine (*Pinus sylvestris* and *P. austriaca*) trees in the park of the Cluj Agricultural Academy were found by the writer, in collaboration with the late Dr. M. Brândză, to be attacked by *Diplodia pinea* [*R.A.M.*, xiv, p. 65], usually described as a saprophyte but assuming in the present case a definitely pathogenic form associated with a rather heavy needle fall. Green needles may contract infection as long as they are attached to the tree; the external symptoms consist of brown spots, darkening to black, mostly near the base. The fungus enters through the stomata and first infects the resin ducts, whence it rapidly permeates the entire leaf. The olivaceous conidia are borne on stalks longer than themselves and measure 28 to 40 by 12 to 16 μ (mostly 32 to 38 by 12 to 14 μ). Besides the leaves the tips of the branches are liable to infection and consequent shedding.

A brief note is also given on a disorder of *P. sylvestris* involving shedding of the young shoots, on which the leaves form thick tufts at the tips and turn yellow.

Fritz (Clara W.). **Red stain in Jack Pine. Its development in creosoted and untreated ties under service conditions.**—*Can. Lumberm.*, liv, 18, pp. 9–10, 3 figs., 1934.

An account is given of tests of the effects of red stain of jack pine [*Pinus banksiana*], due either to *Trametes pini* and accompanied in its final stage by pitting, when it is known as 'red rot', or to an unidentified fungus referred to as 'No. 2' [*R.A.M.*, xiii, p. 135], on railway sleepers in Canada. Bending and compression tests showed that although red stain did not affect the strength of the timber, advanced red rot reduced it by 15 to 25 per cent.

Newly made sleepers examined in 1926 by the Division of Timber Pathology of the Canadian Forest Products Laboratories and found to contain viable red-staining fungi were re-examined in 1933, four years after being laid on the track. Of 3,610 cultures from the heartwood of the non-creosoted sleepers only 5·8 per cent. contained *T. pini*, the same fungus developing in 5·4 per cent. of 1,559 cultures from the creosoted sleepers. Fungus No. 2 was obtained from 14·9 per cent. of the cultures from the untreated and 9·6 of those from the creosoted timber. The data obtained from these and from other sleepers removed from the track in 1931 showed that in the intervening period the activity of *T. pini* had declined in the non-creosoted sleepers while fungus No. 2 was tending to die out in all the sleepers, and the activity of secondary wood-destroying fungi had greatly increased, especially in the untreated sleepers. Although in 1926 no wood-destroying fungus other than *T. pini* had been present, in 1933 60 sleepers examined (of which 20 had been creosoted) yielded 31·1 per cent. secondary wood-destroying organisms, 29·2 per cent. in the untreated, and 1·9 per cent. in the treated sleepers. *Lenzites sepiaria* [ibid., xiii, p. 815], isolated from 31 untreated sleepers, was by far the most actively destructive agent present.

It is concluded that sleepers containing red stain or red rot in amounts not sufficient to cause undue weakening at the outset may be accepted for use on railways.

Thomas (A. V.). **Wood preservation.**—*Malay. Forester*, iii, 3, pp. 119–125, 1934.

A general account is given of the methods of treatment in current use in Malaya for the preservation of timber against fungal, insect, and mechanical damage, with special reference to the economic aspects of the process. *Koompassia malaccensis* and *Dipterocarpus* spp., constituting together nearly 25 per cent. of the commercial trees in the country, have both proved amenable to impregnation and a number of other timbers are undergoing experimental treatment at the Timber Research Laboratories, Sentul, mostly with a half-and-half mixture of Diesel fuel oil and creosote, 6 to 7 lb. per cu. ft., though thanalith [*R.A.M.*, xi, p. 85] is also on trial. Based on present prices, the estimated total cost of impregnation by pressure in Malaya is 80 cents [about 1s. 10d.] per sleeper [cf. next abstract].

Thomas (A.V.). **The possibilities of open tank impregnation of Kempas and other timbers in Malaya.**—*Malay. Forester*, iv, 1, pp. 42–46, 1935.

Further tests on the preservation of *Koompassia malaccensis* in

Malaya [see preceding abstract] are stated to have shown fairly conclusively that an absorption of 7 lb. per cu. ft. of a 50–50 creosote and Diesel fuel oil mixture is adequate for the purpose. Notes are given on the plant required for the open tank treatment and on the method of carrying out the latter. Based on the present cost of creosote at 40 to 44 cents and Diesel fuel oil at 18 cents per gall., the treatment of one sleeper will require about 44 to 46 cents' worth of preservative, to which must be added the operating costs, inclusive of labour, of some 20 cents.

WORONIN (M.). **Plasmodiophora brassicae the cause of Cabbage hernia. Translated from the German into English by C. Chupp.**—*Phytopath. Class.* 4, 32 pp., 6 pl., 1934. [Received March, 1935.]

This very attractively produced booklet contains a carefully prepared translation of Woronin's communication on his discovery of *Plasmodiophora brassicae* as the cause of club root of crucifers, which was published in *Jb. wiss. Bot.*, xi, pp. 548–574, 1878, and which in its turn was an exact translation of his original paper published privately in 1877 in Russian. It also includes a brief biography of Woronin, based chiefly on two obituary notices which appeared in 1903 and 1905, and excellent reproductions of the plates illustrating the original Russian publication, which are still remarkably clear in spite of having been reduced to approximately two-thirds the size of the originals.

MOTTE (M. H.). **Le Plasmodiophora brassicae.** [*Plasmodiophora brassicae.*] —*J. Agric. prat., Paris,* N.S., xcix, 4, pp. 93–94, 1935.

It has been ascertained that, in the Grignon district of France, the spores of *Plasmodiophora brassicae*, the agent of club root of crucifers, are scarcely ever found at a depth exceeding 20 cm. in light and 10 to 20 cm. in heavy soils. A simple means of combating the disease in the seed-bed, therefore, consists in the removal, six to eight weeks before sowing, of the upper soil layer to a depth of 25 cm., thorough working of the deeper strata, and the application of an artificial manure to avoid the risk of introducing infection with stable manure. Field infection may be tested by planting with the preceding crop a small number of the highly susceptible long (Hammer) swede plants.

WALKER (J. C.) & BLANK (L. M.). **Fusarium-resistant Danish Ballhead Cabbage.**—*J. agric. Res.*, xlix, 11, pp. 983–989, 1 pl., 1934.

A brief account is given of the method by which the authors developed from commercial seed of the Danish Ballhead cabbage a homozygous strain (3331B) which in severe greenhouse and field tests in 1932 and 1933 was shown to be entirely immune from cabbage yellows (*Fusarium conglutinans*) even at an average soil temperature of 22° C., at which Wisconsin Hollander [*R.A.M.*, xiii, p. 343] showed a high percentage of the disease. This strain is now being increased for commercial use and will be designated hereafter as Wisconsin Ballhead. It is claimed to combine entire resistance to yellows with the desirable commercial properties of the standard Danish Ballhead.

Chupp (C.). **Macrosporium and Colletotrichum rots of Turnip roots.**—*Phytopathology*, xxv, 2, pp. 269–274, 2 figs., 1935.

Macrosporium herculeum (*Alternaria*) [*A. brassicae*: *R.A.M.*, xiv, p. 140] and *Colletotrichum higginsianum* [ibid., xii, p. 546], hitherto known as leaf parasites of crucifers, have been found to cause serious root rots of turnip both in the field and in storage, the former in Ohio and the latter in New York. *A. brassicae* produces circular, dark brown to black, zonate lesions, while those due to *C. higginsianum* are dirty greyish or pale tan, with an abruptly depressed, fairly regular margin affording ingress to bacteria which impart a pale to tobacco-brown colour and wet appearance to the root. *A. brassicae* is carried in or on the seed and is killed by ten minutes' immersion of the seed in water at 122° F. No evidence was obtained of the transmission of *C. higginsianum* by the seed, but it was shown to overwinter in old diseased foliage.

Osborn (H. T.). **Incubation period of Pea mosaic in the aphid, Macrosiphum pisi.**—*Phytopathology*, xxv, 2, pp. 160–177, 2 figs., 1935.

Pea mosaic [*R.A.M.*, xiv, p. 415] was transmitted under controlled conditions from broad bean (*Vicia faba*) to garden, field, and sweet peas and crimson clover (*Trifolium incarnatum*), and back to the original host, by the pea aphid (*Macrosiphum pisi*). Diseased *V. faba* plants show an irregular, conspicuous mottling, sometimes accompanied by mild stunting, generally appearing from 6 to 14 days after inoculation. On Telephone peas the virus induces leaf wrinkling, stunting, a yellowish, later white, somewhat transparent spotting, and enations resembling those of tobacco mosaic [ibid., xii, p. 538] on the under side. Affected sweet pea leaves show a pronounced wrinkling and streaking, while in crimson clover the leaves develop small, yellowish spots and distinct enations.

The results [which are fully tabulated and discussed] of experiments on the incubation period of the virus in *M. pisi* showed that in 20 out of 23 aphid colonies allowed to feed for limited times on diseased plants before transference to healthy ones, the period ranged from not less than 9 or more than 15 to not less than 21 or more than 48 hours; in one the range was from 72 to 96 hours, while in the two kept at 80° to 90° F. it was only 4 to 10. The virus was found to be retained for considerable periods (up to 29 days) both in individual insects and in colonies.

The potato aphid (*M. gei*) also was capable of transmitting pea mosaic from diseased to healthy *V. faba* plants. No transmission was obtained with the bean aphid (*Aphis rumicis*), and with the usual mechanical methods infection proved to be very difficult to secure.

Snyder (W. C.) & Walker (J. C.). **Fusarium near-wilt of Pea.**—*Zbl. Bakt.*, Abt. 2, xli, 16–21, pp. 355–378, 4 figs., 1935.

A full account is given of the symptoms, etiology, and taxonomy of the 'near wilt' disease of peas in the United States [*R.A.M.*, xii, p. 609], the agent of which has been determined by the senior author as a new form (8) of *Fusarium oxysporum*, Latin and English diagnoses being furnished. The disorder known in Europe as 'St. John's disease' [ibid., xiii, p. 612] is thought to be probably identical with 'near wilt'.

F. oxysporum f. 8 was found to attack varieties completely resistant to wilt (*F. orthoceras* var. *pisi*) [ibid., xiv, p. 71], such as Bruce and Wisconsin Early Sweet, as well as those susceptible to the latter disease, e.g., Laxton's Progress, so that its potentialities as a pathogen are considerable. It is thought that the very noticeable variations [which are described] in the morphological and cultural characters of *F. oxysporum* f. 8 under certain well-defined cultural conditions may be accompanied by corresponding differences in pathogenicity. The range of conidial variation found in the strains studied from a number of different cultures from various parts of the United States, Europe (St. John's disease), and Hawaii was no greater than that obtained in monospore cultures from a single strain. Pending further studies the use of seed from disease-free fields and the usual sanitary practices (including appropriate crop rotation) are the only control measures to be recommended.

Esau (Katherine). **Ontogeny of the phloem in Sugar Beets affected by the curly-top disease.**—*Amer. J. Bot.*, xxii, 2, pp. 149–163, 13 figs., 1935.

Further investigations [which are described and discussed in detail] into curly top of sugar beets [*R.A.M.*, xiii, p. 558] showed that phloem degeneration begins before the leaf is large enough to show any external symptoms. It starts in the phloem parenchyma adjacent to the sieve-tubes after one or two of these have matured in the bundle, the cells nearest the sieve-tubes first undergoing hypertrophy and then dying ('primary hypertrophy' and 'primary necrosis'). Cells more remote are stimulated to growth and division ('primary hyperplasia'). A large proportion of the hyperplastic cells undergo a series of changes characteristic of differentiating sieve-tubes: they develop slime-bodies and plastids, their nuclei and the slime-bodies disintegrate, the amount of cytoplasm is reduced, and the walls thicken. Apparently the sieve-plates fail to complete their development, as no callus forms. Companion cells may or may not be associated with the sieve-tube-like cells in the new tissue. The hyperplastic tissue is very irregular in size and cell distribution, and is so striking in appearance, large groups of thick-walled cells poor in cytoplasm and containing numerous sieve-tube plastids standing out like clear islands among other cells containing normal nuclei and cytoplasm, as readily to identify the disease in its early stages.

The new phloem produced by the cambium after infection is abnormal and consists of degenerate sieve-tubes similar to those just mentioned (though some may mature normally) as well as companion cells and phloem parenchyma. These sieve-tubes and their companion cells subsequently die and collapse ('secondary necrosis'), while the neighbouring parenchyma cells undergo secondary hypertrophy and hyperplasia, this resulting in the formation of proliferations of large thin-walled cells resembling those of an ordinary callus.

That the cells nearest the sieve-tubes are the first to die, while those more remote apparently receive a smaller dose of the virus and are still able to divide, strongly suggests that the substance initiating the

degenerative changes in curly top beets is transported in the mature sieve-tubes.

CARSNER (E.). **Results from U.S. No. 1 resistant Beet seed.**—*Facts ab. Sug.*, xxx, 2, p. 70, 1935.

At the Californian Sugar Beet Conference on 2nd December, 1934, the yield from a planting near King City of the curly top-resistant U.S. No. 1 beet was stated to amount to 13·6 tons with 20·3 per cent. sugar compared with 2·05 tons with 20·9 per cent. sugar from a susceptible variety [*R.A.M.*, xiii, p. 144]. As a result of over-grazing on the foothill cattle ranges there has been much soil erosion and sage brush [*Artemisia tridentata* Nutt., &c.] destruction, followed by an invasion of the Russian thistle [*Salsola kali*: ibid., vii, p. 137] harbouring the beet leafhopper [*Eutettix tenella*]. Further damage will be arrested by legislation, but it will be difficult to eradicate the thistles.

LE CLERG (E. L.). **Dusting and spraying experiments for the control of Sugar-Beet leaf spot in southern Minnesota.**—*Phytopathology*, xxv, 2, pp. 234–243, 1935.

A tabulated report is presented on the data obtained in two seasons' experiments (1931–2) on the efficacy of copper sulphate-lime dust (20–80) [*R.A.M.*, ix, p. 696] and Bordeaux mixture (4–4–50) in the control of leaf spot of sugar beets (*Cercospora beticola*) [ibid., xiii, p. 425] in southern Minnesota. In three tests conducted under epidemic conditions the results in the sprayed plots were slightly superior to those in the dusted, but for practical purposes it would appear that both methods of treatment are of approximately equal utility.

LEACH (L. D.). **Combating Sclerotium root rot.**—*Facts ab. Sug.*, xxx, 2, p. 70, 1935.

It was stated at the Californian Sugar Beet Conference on 2nd December, 1934, that beet plots on which ammonium sulphate or ammonia were added to the irrigation water showed less than a third of the *Sclerotium* [? *rolfsii*: *R.A.M.*, x, p. 165] root rot found in the controls. Cyanamide, worked into the soil three weeks before planting, reduced the incidence of infection by some 50 per cent.

MCKAY (R.). **Germination of resting spores of Onion mildew.**—*Nature, Lond.*, cxxxv, 3408, pp. 306–307, 1935.

In 1930 the writer collected and exposed in the open a crop of onion leaves bearing immense numbers of resting spores of *Peronospora schleideni* [*R.A.M.*, xi, p. 689]. An examination of the material after three years revealed in some cases the partial or total disappearance of the oogonium and a thinning down of the spore wall to 2 to 1 μ. After a period of four years and five months some 1 per cent. of the spores were still viable, germinating after eleven days in water in a warm room by means of a germ-tube 6 to 9 μ in diameter. The germ-tube was seen to reach a length of 960 μ and to branch. Spores partly free from the oogonium and in process of germination were of a pale straw colour; in some instances the germ-tube pushed its way out through the enveloping folds of the persistent oogonium. This is believed to be the first record of germination of the resting spores of onion mildew.

HÜLSENBERG (H.). **Zum Auftreten des Spargelrostes (Puccinia asparagi D.C.) in der Provinz Sachsen.** [On the occurrence of the Asparagus rust (*Puccinia asparagi* DC.) in the province of Saxony.]—*Obst- u. Gemüseb.*, lxxxi, 1, pp. 10–11, 1935.

An account is given of the distribution and economic importance of asparagus rust (*Puccinia asparagi*) in Saxony [*R.A.M.*, xiii, p. 677] and of the life-history of the fungus, with a discussion of direct and indirect control measures. The losses from the disease, which is stated to be most severe in the diluvial sandy soils in the north and east of the province, are estimated for the 1,000 acres under asparagus in the municipal district of Osterburg during the period 1930–3 at about M. 500,000. Promising results in the improvement of the stands have been obtained by appropriate cultural methods, supplemented by three applications of 2·5 per cent. Wacker's Bordeaux mixture with an adhesive such as collophone-potato starch emulsion, calcium caseinate, or Wacker's Haftmittel W. Three treatments should be given between 1st and 15th May, 1st and 15th June, and 1st and 15th July on one- and two-year-old plantings, and two from 15th to 31st July and 15th to 31st August on those of three and four years old. The approximate costs of the treatment per $\frac{1}{4}$ hect., based on the amount of liquid used, irrespective of wages and depreciation of the apparatus, are M. 2·38 for a one-year planting, 5·10 for a two-year, and 4·08 for those of three or four years and above.

GIGANTE (R.). **Il mosaico della Zucca.** [Mosaic of Vegetable Marrow.]—*Boll. Staz. Pat. veg. Roma*, N.S., xiv, 4, pp. 503–530, 1 pl., 11 figs., 1934. [English summary.]

In 1931 vegetable marrow plants in the vicinity of Rome were attacked by mosaic [*R.A.M.*, iv, p. 755; v, p. 523]. The affected leaves showed light green, irregularly distributed, chlorotic areas bordered by a distinct margin and generally limited by the veins. Wrinkling was sometimes present. As the leaves aged, the chlorotic areas turned yellowish-green and occasionally dried up. No symptoms appeared on the stems and leaf stalks, but the fruits showed slight irregularity of shape and most of the affected plants were small and sickly. In the chlorotic areas the leaf lamina was 100 to 130 μ thick, as compared with 130 to 150 μ for the green areas, and had almost isodiametric palisade cells with few or no chloroplasts. In both the chlorotic and green parts of diseased leaves the mesophyll cells were closely set, with much reduced intercellular spaces, and contained X-bodies appearing as small, vacuolated, sometimes granular areas near the nucleus.

The disease was experimentally transmitted to healthy vegetable marrow plants by leaf inoculations with the juice from mosaic leaves, and by means of *Aphis gossypii*; it was not transmitted by the seed.

COOK (W. R. I.) & COLLINS (W. B.). **The life-history of Olpidium majus sp. nov., with notes on Olpidium radicale Schwartz & Cook.**—*Ann. mycol., Berl.*, xxxiii, 1–2, pp. 72–78, 1 pl., 5 figs., 1935.

A detailed description, supplemented by a Latin diagnosis, is given of *Olpidium majus* n.sp., isolated from diseased cucumber roots in a greenhouse at Llandaff, Glamorganshire. Reasons are given for the

differentiation of this fungus from other species of the same genus attacking the higher plants, including the closely allied *O. radicale* [*R.A.M.*, viii, p. 247], some corrections in the measurements of which originally given are made. *O. majus* owes its name to the exceptionally large dimensions of the zoosporangia—30 to 140 by 20 to 35 μ.

WARE (W. M.). **Mushroom-growing.**—*Bull. Minist. Agric., Lond.*, 34, 54 pp., 14 pl., 1935.

This second edition of the Ministry's bulletin on mushroom growing [*R.A.M.*, xii, pp. 72] is written by W. M. Ware in collaboration with S. J. Jary and M. D. Austin, who are responsible for the section on pests. It embodies a considerable amount of new information, acquired by the senior author in the course of a recent visit to some of the chief mushroom-growing areas in the eastern United States; in addition, the earlier text has been revised and elaborated. A chronologically arranged list of eighty-six references to the literature of the subject is appended.

SANDS (W. N.). **The Padi straw Mushroom in Kedah.**—*Malay. agric. J.*, xxiii, 2, pp. 76–77, 2 figs., 1935.

Exceedingly fine specimens of the edible mushroom *Volvaria volvacea* [*R.A.M.*, xiii, p. 420; xiv, p. 286] were found in November, 1934, growing naturally on a stack of rice straw at the Experiment Station, Kedah, Malaya, many others later being found in the vicinity. The fungus appears to be indigenous and widely distributed in Kedah. Under natural conditions the fruiting bodies are produced chiefly during the local wet season (June to November), when the fungus could be cultivated commercially, as it could be also in the drier months if precautions were taken to maintain humid conditions in the beds. Past failures to grow the mushroom have been mainly due to the absence of suitable protection from sun and wind.

CHAZE (J.) & SARAZIN (A.). **Contribution à l'étude de la môle, maladie du Champignon de couche. Morphologie interne des Psalliotes parasités.** [Contribution to the study of the 'môle' disease of the edible Mushroom. Internal morphology of the parasitized *Psalliotae*.]—*C. R. Acad. Sci., Paris*, cc, 4, pp. 343–346, 1935.

Both on its host, the edible mushroom (*Psalliota*) [*campestris* and *P. arvensis*], and in culture, *Mycogone* [*perniciosa*: *R.A.M.*, xiv, p. 345], one of the agents of the destructive malady known as 'môle' in France, forms short, cylindrical, septate hyphae terminating at the apex in a chlamydospore, whereas the often associated species of *Verticillium* produces long, slender, branched hyphae ending in an elongated spore. Penetrating the interior of the mushroom, the hyphae of *M. perniciosa* elongate considerably and simultaneously produce haustorial protuberances which indent and then perforate the cells of the pseudoparenchyma of the host. These hyphae terminate in clubs, spheres, or spatules which in turn proliferate and give rise to new hyphae of variable aspect. At a very advanced stage of infection the mushrooms lose their solid consistency, the tissues turning blackish-brown. The cells of the host are crushed and disintegrated, their contents exuding in the form of brownish drops swarming with bacteria; ultimately the sporophore

collapses, emitting a fetid odour. This final stage is preceded by the formation within the cap, and more especially inside the stalk, of spore-lined pockets resulting from cellular disintegration.

The *Verticillium* hyphae appear to be localized in the hymenial lamellae of the pileus whence they rapidly emerge either at the extremity of the lamellae or at the junction between two below the cap. Without causing the striking deformations typical of *M. perniciosa*, the associated *Verticillium* is responsible for extensive disorganization of the hymenial layers which takes a great variety of forms. The basidia of affected pilei are nearly always sterile.

FERRARIS (T.). **Notizie fitopatologiche. Il black della Vite in Jugoslavia.** [Phytopathological notes. Black rot of the Vine in Jugo-Slavia.]—*Riv. agric., Roma*, xxxi, 701, p. 52, 1935.

In October, 1934, grapes from Veglia, Jugo-Slavia, submitted to laboratory examination at Conegliano and also at Alba, were ascertained to be affected with black rot [*Guignardia bidwellii*]. The disease has not so far been recorded in Italy [cf. *R.A.M.*, vi, p. 639].

DU PLESSIS (S. J.). **Botrytis rot of Grapes, and its control during 1933–1934.**—*Fmg S. Afr.*, ix, 104, pp. 439–442, 1934.

Continuing his investigations on the control of *Botrytis* [*cinerea*] on grapes in South Africa [*R.A.M.*, xiv, p. 213, and next abstract], the writer gives some general recommendations for vineyard practices, including picking, packing, and fungicidal treatment, confirms his previous observations on the efficacy of copper sulphur (capex) and verderame sulphur dusts, and advises the testing of the following additional precautions: (1) a light spraying of the bunches immediately before wrapping with 4 per cent. formalin, or (2) fumigation with formaldehyde gas before or after packing, using 2·9 pints of a 40 per cent. formalin solution and 23 oz. potassium permanganate per 1,000 cu. ft. overnight, or double the quantity for not more than one hour.

BOYES (W. W.), BEYERS (E.), & DE VILLIERS (D. J. R.). **Preliminary experiments on the control of wastage of table Grapes.**—*Rep. Low Temp. Res. Lab., Capetown, 1933*, pp. 94–95, 1935.

In experiments conducted in 1934 at the Low Temperature Research Laboratory, Cape Town, table grapes in cold storage were submitted to the following treatments: exposure for 10 and 20 minutes to sulphur dioxide gas [*R.A.M.*, xiv, p. 422], dipping in a solution of nascent sulphur dioxide, in pentathionic acid, in formaldehyde, and in bleaching powder, and packing in woodwool sprayed with formaldehyde or acetaldehyde. The only treatment which consistently showed possibilities of effectively controlling fungal wastage was dipping in nascent sulphur dioxide; with the variety Henab Turki (the most susceptible to wastage of those tested) this was the only method which was not distinctly injurious to the fruit.

It is mentioned that the term 'wastage', as applied to stored grapes in South Africa, is usually considered to indicate wastage due to *Botrytis* [*cinerea*: see preceding abstract] and *Penicillium glaucum*.

Dufrénoy (J.) & Genevois (L.). **Développement du Cladosporium herbarum sur des Raisins à basse température.** [The development of *Cladosporium herbarum* on Grapes at a low temperature.]—*C. R. Soc. Biol. Paris*, cxviii, 7, pp. 708–710, 2 figs., 1935.

Chasselas grapes stored in France at a temperature of 0° C. with 83 per cent. relative humidity kept well for three months apart from the blackening of a small proportion (2 per cent.) by *Cladosporium herbarum*, not hitherto reported in this connexion. The development of this fungus at a low temperature range has been the subject of comment by various writers [cf. *R.A.M.*, xiii, pp. 701, 796]. At 0° the pulp of the fruit is permeated almost as far as the pips. When removed to a temperature of 17° the fungus, either on the grape lesions or in pure culture, rapidly forms conidiophores and conidia.

England and Wales: new and interesting phytopathological records for the year 1934.—*Int. Bull. Pl. Prot.*, ix, 3, pp. 53–54, 1935.

The following phytopathological records of 1934, according to official information from the Ministry of Agriculture and Fisheries, are new for England and Wales: *Wojnowicia graminis* on wheat; *Marssonina daphnes* on *Daphne mezereum* [*R.A.M.*, xiv, p. 173]; *Bacterium vignae* var. *leguminophila* on dwarf bean [*Phaseolus vulgaris*] seeds [ibid., xiv, p. 16]; *Bact. rathayi* on cock's-foot grass [*Dactylis glomerata*: see below, p. 514]; *Thielaviopsis basicola* [ibid., xiv, p. 147] on celery and *Lilium* roots; and the uredo- and teleutospore stages of *Ochropsora sorbi* Diet. (previously only found in England in its aecidial stage on *Anemone nemorosa*) on an unidentified species of *Prunus* or *Pyrus*.

Small (T.). **Report of the Mycologist.**—*Rapp. Jersey, aux Etats de 1934*, pp. 24–38, 1935.

This report contains, among others, the following items of phytopathological interest [cf. *R.A.M.*, xiii, p. 591]. Further trials showed conclusively that the development of blight (*Phytophthora infestans*) in potato tubers exported from Jersey is almost entirely due to their being dug while the disease is present on the haulms. In some seasons spraying is so effective that no further precaution is necessary, but once a satisfactory crop of tubers has formed the haulms should be removed, either at once or as soon as the first sign of blight appears.

The tomato diseases present in Jersey are listed, together with the organisms responsible for them, and it is stated that spotted wilt was observed for the first time locally in 1934, on seedlings and older plants in the greenhouse: the plants were destroyed and no further outbreak occurred. In the same season *Septoria lycopersici* was also noted for the first time on tomatoes. A serious tomato disease that has been present for several years appears soon after the plants are set in the field; the leaf veins turn black, the necrosis spreading to the entire leaf and petiole; finally, the leaf dies and falls. New growth becomes affected in turn. Later, brown to silvery-grey areas appear on the stem, and the plant becomes hard, rustling when handled. Death generally ensues before any fruit is formed. The trouble is probably due to soil factors.

The Danish swede variety Wilhemsburger was found to be very

resistant to infection by *Plasmodiophora brassicae* [ibid., xiii, pp. 140, 343].

In the section of this publication dealing with horticulture (pp. 38–51) by E. G. Ing, an annotated list is given of fruit and flower diseases observed during the period under review.

Mourashkinsky (K. E.). Новые болезни культурных растений Западной Сибири. [New diseases of cultivated plants in western Siberia.]—*Trans. Omsk Inst. Agric.*, i, 6, pp. 3–30, 1935. [English summary.]

The author gives brief notes on a number of diseases of cultivated ornamental and economic plants, which he considers to be new in western Siberia; he divides them roughly into two classes, namely, those recently introduced from abroad, and those that have spread from other crops or wild plants to new hosts, adding a few whose origin is very difficult or impossible to determine. To the last category belongs a disease of oats locally known as 'zakooklivanie' ['pupation'] which was first recorded in 1922 in the vicinity of Omsk [cf. *R.A.M.*, xii, p. 306], since when it has spread to the Urals in the west and to the Pacific Ocean in the east, but is not known to have penetrated into European Russia nor to have been described from any other part of the world. The macroscopic symptoms are very characteristic; the affected oat plants exhibit an abnormally prolific tillering, some plants developing as many as 50 to 60 shoots. Sometimes at the very beginning of the summer the leaves take on a reddish, later brownish, colour and lose their elasticity. In severe cases the plants do not develop beyond the tillering stage, but more usually they are only more or less severely stunted, and form secondary shoots. Affected panicles are either abnormally dense owing to a dense branching of the foreshortened rachillae, or abnormally thin owing to the reduction in the number of spikelets or to the fact that the branches remain closely adpressed to the main axis of the inflorescence; occasionally the panicles do not emerge entirely from the leaf sheaths. Other frequent symptoms are virescence of the panicles which may develop, especially on secondary stems, into green shoots [loc. cit.], the glumes then assuming the character of true leaves; abnormally numerous florets in the spikelet (up to 6 instead of 2 or 3), on long stalks; abnormal elongation of the ovaries, which protrude far out of the glumes and become green; abnormal elongation of the stamens, and total or partial sterility of the affected plants. The disease is believed to be due to a virus, and may be an example of infection of the crop from local wild Gramineae, many of which, especially in the genus *Bromus*, exhibit very similar symptoms.

The other diseases dealt with include mosaic of wheat and rye, first recorded near Omsk in 1932 and 1933, respectively; *Bacterium translucens* [ibid., viii, pp. 151, 359] on barley; smut (*Ustilago zeae*), *Basisporium gallarum* [*Nigrospora* spp.: ibid., xiii, p. 299], and *Fusarium moniliforme* [*Gibberella moniliformis*] on maize; smut (*Ustilago bromivora*) on *Bromus japonicus*; powdery mildew (*Oidium fragariae*) [*Sphaerotheca humuli*] on strawberry, and crown gall (*Bact. tumefaciens*) on apple. Safflower (*Carthamus tinctorius*), a fairly recent introduction into western Siberia, is attacked there by *Septoria carthami* [ibid., vi, p. 355],

which is believed to have been introduced with infected seeds, and by a rust which morphological studies and cross-inoculations have shown to be *Puccinia verruca*; this fungus is locally widespread on *Centaurea scabiosa* [cf. loc. cit.].

In 1934 *Daldinia concentrica* [ibid., ix, p. 142], a common local semi-saprophyte, was found frequently causing a serious stem rot of Siberian apples (*Pyrus baccata*) which had been severely injured by frost in 1929–30 in Omsk. American maple (*Acer negundo*), which is much appreciated as a shade tree in the region, suffers from a bacterial leaf spot, the causal organism of which has not yet been identified.

CONNERS (I. L.). **Fourteenth Annual Report of the Canadian Plant Disease Survey.**—viii+116 pp., 1935. [Mimeographed.]

Notes are given on the prevalence in Canada during 1934 of fungous, bacterial, virus, and physiological diseases of cereals, forage and fibre, vegetable and field, and fruit crops, forest and shade trees, and ornamental and miscellaneous plants [cf. *R.A.M.*, xiii, p. 562]. The new foot rot of oats described by Sanford in 1933 [ibid., xiii, p. 224] has been found to be due to *Colletotrichum graminicolum* [ibid., xii, p. 212], which was also observed for the first time in the country causing anthracnose of wheat. *Pythium arrhenomanes* [ibid., xiii, p. 758] was shown by Vanterpool to be capable of attacking a number of commonly cultivated grasses [a list of which is given], and is stated to be probably the chief cause of browning root rot of wheat in Canada.

Yellow leaf blotch of lucerne (*Pseudopeziza jonesii* Nannf. = *Pyrenopeziza medicaginis* Fuck.) [ibid., xii, p. 177] was definitely ascertained by Eastham to be present in British Columbia.

Another new record for Canada is mosaic on seed mangolds on Lulu Island, near Vancouver [cf. ibid., x, p. 575], and on Swiss chard [*Beta vulgaris* var. *cycla*] in Saskatchewan.

Up to 100 per cent. infection of Danish Ballhead and Golden Acre cabbage in the Fraser Valley, British Columbia, was caused by *Phoma lingam* [ibid., xiii, p. 488]; the crop was destroyed to prevent the establishment of blackleg in the Province. Cauliflowers in British Columbia and Manitoba were attacked by the black leaf spot due to *Alternaria circinans* (B. & C.) Bolle [*A. oleracea*: ibid., xiv, p. 286], which was also reported, together with the grey leaf spot (*A. herculea*) [*A. brassicae*: ibid., xiv, p. 340], on broccoli in British Columbia for the first time.

A sweet cherry disease in the Nelson district of British Columbia, characterized by foliar mottling and crinkling, often accompanied by shot hole and arrested twig growth, is suspected to be a form of mosaic [cf. ibid., x, p. 252]. A tree on which diseased scions were grafted in 1933 is reported to have shown the typical mosaic symptoms in 1934.

Colchicum autumnale was infected in Ontario by *Urocystis* [*Tuburcinia*] *colchici* [ibid., xiii, p. 596], while lilac in Nova Scotia was affected by mosaic.

Statistics relating to seed potato certification are presented in tabular form on pp. 39–40, and a large number of interesting notes and records on pathogenic organisms and physiological disturbances, other than those mentioned above, are also included in the report.

EASTHAM (J. W.). **Report of Provincial Plant Pathologist.**—*Rep. B.C. Dep. Agric. 1934*, pp. R30–R37, 1935.

In further spraying tests against apple scab [*Venturia inaequalis*] carried out in 1933 in the West Kootenay district of British Columbia an extensive trial with the ferrous sulphate, lime-sulphur, calcium arsenate (10–2½–5) mixture previously used [*R.A.M.*, xiii, p. 682] gave very encouraging results, though the cost was about double that of lime-sulphur alone. The mixture was then used at the weaker concentrations of 6–1½–3, ditto with the final application omitted, 6–1½–1, and 4–1–2, one plot being sprayed with lime-sulphur (1 in 40) alone; the applications were made on 1st and 18th May, and 5th and 22nd June, and the fruit was picked on 18th September. The [tabulated] results showed a distinct reduction in efficiency when any ingredient was reduced below the 6–1½–3 ratio, and this formula will probably be adopted throughout the area in the next season's work.

Appreciable loss was caused to sweet cherries, especially of the Bing variety, by brown rot (*Sclerotinia cinerea*) [*S. laxa*: ibid., xiii, p. 33]; the disease usually develops more slowly than that due to *S. americana* [*S. fructicola*], which is often destructive in the Fraser valley.

As infection of loganberries with 'dry berry' disease (*Haplosphaeria deformans*) [ibid., xii, p. 772] takes place in the open blossoms, and blossoming extends over a considerable period, the only feasible control consists in finding resistant strains.

Experiments at Armstrong indicated that White Odessa, Hussar, Ridit, and Oro wheats are resistant to the local physiological forms of bunt [*Tilletia caries*: ibid., xiii, p. 682].

Blossom blight of cherries, which for some years has caused serious losses in the Victoria and Saanich districts of British Columbia, is due to a fungus identified at the Oregon Agriculture College as *Monilia oregonensis* [ibid., vii, p. 32] and considered to be distinct from *S. cinerea* [*S. laxa*]. When Montmorency, Early Richmond, Morello, and Olivet cherry trees and Peach plums were sprayed against this disease with Bordeaux mixture at different stages, the trees sprayed at the bud, bud and calyx, calyx, flowering, and flowering and calyx stages showed, respectively, 34·1, 27·1, 26·8, 16·3, and 28·7 per cent. more clean fruits than the unsprayed controls.

Summary report of progress, 1934.—*Bull. Me agric. Exp. Sta.* 377, pp. 323–426, 1 pl., 15 figs., 2 graphs, 1934.

In 1934 the Maine potato spray service, which is directed by the local Farm Bureau and assisted by the Experiment Station workers at Aroostook Farm, posted notices to all co-operating farmers informing them whenever spraying ought to be effected; timely warnings were sent out when late blight [*Phytophthora infestans*: *R.A.M.*, xii, pp. 240, 613] first appeared, together with notes on its prevalence and the occurrence of weather conditions favouring spread. The number of growers taking advantage of the service rose to 3,006 [ibid., xiii, p. 495], an increase of nearly 600 over the previous year.

Further experiments showed that Bordeaux mixture containing a high calcium percentage was markedly inferior to a dolomitic (magnesium-containing) Bordeaux mixture [ibid., xiii, p. 725] in increasing

the yield [when used mainly against late blight] of potatoes in a highly acid soil deficient in magnesium.

Aphis abbreviata did not transmit latent mosaic from Green Mountain potatoes, but took the second (and distinguishing) component of mild, leaf-rolling, and rugose mosaics and streak to a Green Mountain seedling free from latent mosaic. In some areas this aphid appeared to be more important than *Macrosiphum solanifolii* [*M. gei*] or *Myzus persicae* in the early transmission of virus diseases.

Healthy Green Mountain potatoes one row removed from mild mosaic plants became 43 per cent. diseased [ibid., xiii, p. 495], others 15 and 100 ft. away from the affected plants developing 30 and approximately 17 per cent. infection, respectively. Seed plot stock free from mild mosaic in 1933 and grown in an isolated tuber unit seed plot developed 1·7 per cent. mild mosaic in 1934, though the nearest other potatoes were several hundred feet away. Leaf roll spread less rapidly than mild mosaic, but was carried at least 200 ft. The Chippewa and Katahdin varieties [ibid., xiii, p. 591] readily contracted leaf roll in isolated plots but were resistant to mosaic. The latter variety was grown in an increase seed plot in 1933 and rogued free from all visible diseases; the foundation seed stock so obtained was distributed, and the variety is now under general cultivation locally. The more recently developed Chippewa variety was also grown in an increase seed plot in 1933, and the seed stock distributed; this variety is very popular, the demand greatly exceeding the supply.

Even under conditions very favourable to infection the so-called Rust Proof variety [ibid., xii, p. 613] is highly resistant to foliage and tuber infection with *P. infestans*.

A comparison of 368 small McIntosh apple trees mostly given the same treatment for seven consecutive years against scab [*Venturia inaequalis*: ibid., xiii, p. 496] showed that the number of blossom clusters was significantly lower in the lime-sulphur series (8·2) than in the lead arsenate (30·3), sulphur dust (29·5), or sulphur-dry-mix series (25·7).

In 1933, maize in south-eastern Maine was severely affected by bacterial wilt [*Aplanobacter stewarti*: ibid., xiv, p. 354], but in the following year there was little evidence of natural infection, which was noticeable only early in the season, the plants apparently recovering during the summer.

ADAMS (J. F.). **Report of the Plant Pathologist for 1934.**—*Bull. Del. Bd Agric.*, xxv, 1, pp. 3–15, 1 graph, 1935.

In connexion with the Delaware spray service it is mentioned that from 9th April to 29th May, 1934, there were ten spore discharge periods of the ascospores of the apple scab fungus [*Venturia inaequalis*]—two more than in the previous year [*R.A.M.*, xiii, p. 563]. Notes are given in popular terms on a number of well-known diseases of fruit, field and vegetable, cereal and forage crops, and ornamentals recorded in the State during the period under review, as well as on nursery inspection and regulatory work.

Seventh Biennial Report of the Director Kansas Agricultural Experiment Station for the biennium 1st July, 1932, to 30th June, 1934.—147 pp., 3 figs., 1934. [Received May, 1935.]

Among the items of phytopathological interest in this report, besides

those already noticed from other sources, the following may be mentioned. A high degree of resistance to oat smut [*Ustilago avenae*] has been shown by some Burt and Early Red Texas selections, as well as by strains within the crosses Fulghum × Markton, Richland × Fulghum, and Kanota × Markton [*R.A.M.*, xiv, p. 761].

Superphosphate and chicken manure (especially the latter) have been found helpful in the control of take-all of wheat (*Ophiobolus graminis*) [see below, p. 502]. During the last five years it has been observed that a patch of take-all, appearing in one year, will increase during the second in size and virulence, show a corresponding decrease in the third, and may not reappear in the fourth. However, if soil from the former site of a take-all patch is transferred to the greenhouse, wheat planted thereon will contract the disease under favourable moisture conditions. The disease is promoted by a combination of high soil moisture and low temperatures. The addition to take-all-free soil, inoculated with diseased plant material, of several strains of bacteria materially reduced the activity of *O. graminis* [cf. ibid., xiv, p. 157]. The fungus has been found to a depth of 20 in. below the soil surface. The so-called 'dry land' foot rot, occurring in semi-arid regions especially in early sowings of winter wheat, is characterized by variable symptoms and may be due to a number of different fungi.

Promising results in breeding wheat resistant to leaf [brown] rust [*Puccinia triticina*: ibid., xiv, p. 229], have been obtained with several selections of Kanred × Kawvale, Kawvale × Blackhull, Kawvale × Tenmarq, and Hard Federation × Kawvale. Compound crosses such as (Kanred × Fulcaster) × (Kanred × Hard Federation), (Kanred × Fulcaster) × Tenmarq, and (Kanred × Fulcaster) × Iobred continue to exhibit greater resistance than most of the simple crosses. Physiologic form 9 of the rust [ibid., xiv, p. 88] is still the most widely distributed form in the western Mississippi Valley and Great Plains area. The rust withstands winter conditions over a large part of this region, but spring infection seems to be mainly due to inoculum borne on northerly winds.

Ten minutes' immersion of potato tubers in acidified mercuric chloride solution was equally effective in the control of *Rhizoctonia* [*Corticium solani*] with 90 minutes in a non-acid one [ibid., xiii, p. 496; xiv, p. 118]. In 1932 the incidence of infection by *C. solani* on plants from healthy seed in twenty commercial fields was 32·18 per cent., compared with only 12·50 per cent. in the excessively hot and dry summer of 1933.

The best control of cherry leaf spot [*Coccomyces hiemalis*: ibid., xiv, p. 376] was given by Bordeaux or Oxo-Bordeaux [ibid., xii, p. 358], lime-sulphur and wettable sulphur causing a yellow discoloration of the foliage.

Empusa grylli [ibid., xiv, p. 234] was found destroying grasshoppers in the field in 1930 to 1932.

Botany.—*Rep. Mich. agric. Exp. Sta., 1932–1934*, pp. 17–19, [?1935].

Experiments in the control of fireblight [*Bacillus amylovorus*: *R.A.M.*, xiii, p. 707] of Bartlett pear trees conducted in Michigan during August, 1933, using Day's zinc chloride spray treatment [ibid., vii, p. 383],

completely eliminated all canker extension and twig blight up to June, 1934, though the untreated trees were badly affected by canker and twig and blossom blight. Investigations are in progress to ascertain whether the leaf-hopper *Macropsis trimaculata*, the vector of peach yellows [ibid., xiii, p. 563], may also transmit peach 'red suture' [ibid., xiv, p. 219].

Evidence was obtained that gladiolus scab [*Bacterium marginatum*: ibid., xii, p. 356; xiii, p. 168] became more abundant as the lime content of the soil increased, and that it was more prevalent in badly than in well-drained soils. A satisfactory homozygous, white-flowered strain of snapdragon [*Antirrhinum majus*] was produced, which was entirely free from rust [*Puccinia antirrhini*: ibid., xiv, p. 172]; some coloured, rust-free strains are being used in an attempt to obtain homozygous, coloured strains. The Californian-grown Ragged Robin rose, hitherto extensively employed as a stock for choice rose varieties, was proved to be infected with mosaic [ibid., xi, p. 374; xiv, p. 363].

Michigan Golden celery, besides being very resistant to yellows (*Fusarium* spp.) [ibid., xiv, p. 418], was also of good market quality. Several forms of celery mosaic occur in Michigan, where the disease was transmitted by celery aphids and cotton aphids [*Aphis gossypii*: ibid., xii, p. 136].

Selections of resistant tomato plants of different varieties resulted in the production of a strain of John Baer with only 5 to 10 per cent. wilt (*Fusarium*) [*lycopersici*], as compared with 70 to 90 per cent. in the original strain.

Asuyama (H.). **New diseases and pathogens reported in the year of 1934 on our cultivated plants in Japan.**—*Ann. phytopath. Soc. Japan*, iv, 3–4, pp. 191–197, 1935. [Japanese.]

Bibliographical references are given to the following new records of plant diseases and pathogens in Japan during 1934, other than those already reported in this *Review*: black leaf spot of rice (*Entyloma oryzae*, of which *Ectostroma oryzae* and *Sclerotium phyllachoroides* are stated to be synonyms) [*R.A.M.*, xiv, p. 331]; browning root rot of wheat and barley (*Pythium* sp. [ibid., xi, pp. 164, 294 and above, p. 494] and *Nematosporangium* sp.); bacterial leaf spot of lettuce (*Lactuca sativa* var. *angustana*) caused by *Bacterium lactucae* Yamamoto; black rot of Japanese pear [*Pyrus serotina*] due to *Physalospora piricola* Nose; leaf and blossom blight of loquat [*Eriobotrya japonica*] (*Entomosporium* sp. and *Botrytis* sp., respectively); fig rot (*Rhizopus nigricans*); soft rot of squash (*Choanephoroidea cucurbitae* Miyake et Ito) [cf. ibid., xiii, p. 673]; cottony leak of beans [*Phaseolus vulgaris*] caused by *Pythium* (*N.*) *aphanidermatum* [ibid., vii, p. 2; ix, p. 561]; stem and brown cankers of rose due, respectively, to *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: ibid., xiv, p. 313] and *Diaporthe umbrina* [ibid., xiii, pp. 230, 637]; bacterial leaf spot of begonia (*Bact. begoniae* Takimoto); *Agapanthus* seedling and leaf blight (*Phytophthora parasitica*); lily blight (*P. parasitica* and *P. cactorum*) [ibid., x, pp. 83, 667]; and black culm rot of bamboo (*Colletotrichum hsienjenchang* Hino et Hidaka). In each case the common name of the disease and the journal reference to its record are given in English; the scientific name of the pathogen is also given.

Schilberszky (K.). **Beiträge zur Biologie von Pseudomonas tumefaciens.** [Contributions to the biology of *Pseudomonas tumefaciens.*] —*Z. PflKrankh.*, xlv, 3, pp. 146–159, 1 fig., 1935.

The first case of crown gall (*Bacterium tumefaciens*) on the vine in France is stated to have been observed in 1853, while the earliest American record of the disease dates from 1892. Eight types of tumour are briefly differentiated according to their dimensions and consistency on various representative hosts. The results of inoculations with an emulsion from macerated material of a large (37 by 31 mm.) gall at the base of a *Petunia hybrida* stem at the Budapest Horticultural College on *Pelargonium zonale*, *Cineraria hybrida* [Willd. = *Senecio cruentus* DC.], and *Primula obconica* were positive at the end of 76 days in the first-named test plant only [*R.A.M.*, xiii, p. 498]. The tumours thus induced on *Pelargonium zonale* were totally different from the parent gall on *Petunia hybrida.* In the former they were pale yellow, later greyish-brown, in the latter dark brown and granular. Anatomically the *Pelargonium* galls were characterized by immense numbers of parenchyma cells and in most cases by scattered vascular elements in groups of two or three. The tissues of the *Petunia* tumour contained exclusively elongated parenchyma cells, of unequal size in places.

Bact. tumefaciens is a source of economic damage chiefly on young grafted fruit trees, certain stocks being much more susceptible than others [ibid., xi, p. 47]. In Hungary pears seem to suffer more severely from the disease than apples, and of recent years infection has assumed an epidemic form (up to 90 per cent.) on the former host. B. Husz has found wild pear stocks much more susceptible than quinces. The following control measures were made compulsory by the Hungarian plant protection authorities in 1930: sterilization of the soil frame, 10 to 14 days before sowing, with 0·25 per cent. uspulun (10 l. per sq. m.); similar treatment of the soil in which the seedlings are to be transplanted (0·5 per cent.); prior to delivery half an hour's immersion of the cuttings to above the root origins in a paste of 50 kg. of sand and argillaceous earth in 100 l. water with the addition of 0·5 per cent. uspulun, bigriol, higosan [ibid., xiii, p. 278], or tillantin [cf. ibid., xiii, p. 102].

Humphrey (H. B.), Stakman (E. C.), Mains (E. B.), Johnston (C. O.), Murphy (H. C.), & Bever (W. M.). **The rusts of cereal crops.**—*Circ. U.S. Dep. Agric.* 341, 26 pp., 4 figs., 6 diags., 1935.

A semi-popular account is given of the symptoms, life-histories, physiologic specialization, epidemiology, and control of the principal rusts (*Puccinia* spp.) attacking cereals in the United States.

Asperger (K.). **Zur Frage der Überwinterung von Puccinia triticina Erikss. und Puccinia graminis Pers. in ihren Uredoformen.** [On the question of the overwintering of *Puccinia triticina* Erikss. and *Puccinia graminis* Pers. in their uredo forms.]—*Z. PflKrankh.*, xlv, 3, pp. 131–143, 2 figs., 1935.

In discussing the overwintering of brown rust of wheat (*Puccinia triticina*) in the form of uredosori in the neighbourhood of Vienna the author states that this is not likely to occur on dead plant material. In his experiments uredo material collected in July germinated only

very feebly in the following December when kept in the open under a cover [*R.A.M.*, xiii, p. 82], and by January attempts to infect wheat with the uredospores gave almost negligible results. The survival of the rust in the form of successive generations of uredospores on living wheat seedlings is, however, a possibility to be considered, especially after mild winters. By maintaining plants of the comparatively susceptible Dioszeger variety in the laboratory under conditions approximating to those obtaining in the field during the winter, it was possible to prolong the incubation periods of *P. triticina* and *P. graminis* to 44 and 45 days, respectively. It is reasonable to suppose that in nature these periods are considerably longer, so that both rusts are evidently capable of withstanding in the mycelial condition the rigorous winter climate in the locality in question. Microscopic and field examination showed that in both *P. triticina* and *P. graminis* the mycelium remained viable, with occasional uredo pustule formation in the case of the former only, until the spring, though during the latent period it did not as a rule assume an aggressively parasitic character. In the case of *P. graminis* no pustules were observed between the autumn and the early summer, so that in this rust perpetuation by means of successive generations of uredospores is excluded. The late development of this rust in the summer months indicates that overwintering in the form of latent mycelium can play little part in the initiation of the annual attack, which would appear to depend mainly or altogether on the teleutospore stage of the fungus.

MARCHIONATTO (J. B.). **Argentine Republic : yellow rust in the Wheat-growing region. Behaviour of the cultivated varieties vis-à-vis the disease.**—*Int. Bull. Pl. Prot.*, ix, 4, pp. 79–80, 1935.

Further studies were conducted under official auspices in 1934 to determine which regions of the Argentine Republic are most severely affected by the comparatively recently introduced yellow rust of wheat (*Puccinia glumarum tritici*) and the reaction of a number of standard varieties to the disease [*R.A.M.*, xi, p. 359; xiii, p. 619]. The first infections in the Buenos Aires district were observed at the beginning of the second half of September. Of 353 specimens of diseased wheat submitted for examination from seven provinces, 182 originated in Córdoba and 128 in Buenos Aires. The only variety showing a high degree of resistance to the fungus was Ardito, discarded by the Ministry of Agriculture on account of its low baking value.

SCHILCHER (E.). **Rostbekämpfung mit Kalkstickstoff.** [Rust control with calcium cyanamide.]—*Neuheiten. PflSch.*, xxviii, 2, pp. 34–36, 1935.

Negative results were given by the writer's experiments in 1933–4 at Petzenkirchen, Austria, on the control of brown rust of wheat (*Puccinia triticina*) by dusting the plants with calcium cyanamide and kaolin in the proportion of 1 : 99 [*R.A.M.*, xiii, p. 83], one to nine applications being given. The tests will be repeated, since it is thought that the calcium cyanamide concentration may have been too low for outdoor conditions, under which the comparatively robust foliage offers less likelihood of damage from the treatment than the softer leaves of greenhouse plants.

NAGAI (Y.). **Relation between brown rust of Agropyron, Puccinia agropyri Ell. et Ev. and certain plants.**—*Ann. phytopath. Soc. Japan*, iv, 3–4, pp. 121–136, 10 figs., 1935. [Japanese, with English summary.]

The results of inoculation experiments in Japan with the uredospores of *Puccinia agropyri* E. & E. from *Agropyron semicostatum* on the leaves of barley, wheat, rye, oats, and a number of common grasses are described. The germ-tubes entered the stomata of all the hosts tested as freely as those of *A. semicostatum*. On barley and rye seedlings uredosori were sometimes formed within a few days of inoculation and the spores from these sori infected further plants for several generations. Infection is also readily contracted in the field by barley and rye growing in proximity to *Agropyron*. The mesophyll cells in the diseased areas lose their turgidity, the chloroplasts shrink and become fewer, and the haustoria that have penetrated these cells appear to become inactive; haustoria in the overlying epidermal cells, however, as well as those in the parenchyma sheath, remain vigorous and functional for a longer period. A limited degree of necrosis only was produced on inoculated oats (cultivated and wild), wheat, and *Bromus japonicus*, the haustoria entering these plants becoming disorganized with the cells in which they occur and being unable to function as long or as actively as in rye or barley. On some of the other grasses there was no visible necrosis, though about three haustoria were formed by the rust hyphae after entry.

MARTINY. **Der Stand der Getreidebeizgeräte nach dem Ergebnis der Reichsnährstands-Hauptprüfung 1934.** [The status of seed-grain disinfection apparatus according to the outcome of the Reich Food Board general trial 1934.]—*Dtsch. landw. Pr.*, lxii, 10, pp. 123–124; 11, p. 135, 6 figs., 1935.

Recommendations, based on the outcome of the general trial of seed-grain disinfection apparatus by the Food Board of the German Reich in 1934, are given for the selection of the different types of machine according to individual requirements, together with technical details of construction and application and some indications of the costs of treatment [cf. *R.A.M.*, xii, p. 643 *et passim*].

PICHLER (F.). **Erprobung von Saatgutbeizmitteln im Laboratorium. I. Gegen Weizensteinbrand.** [The laboratory testing of seed-grain disinfectants. I. Against Wheat bunt.]—*Z. PflKrankh.*, xlv, 3, pp. 113–131, 1935.

Details are given of a method, originally developed by the writer (*Chem. Ztg*, xlix, 1925) and since used with success by other workers, for the evaluation in the laboratory of seed-grain disinfectants against wheat bunt [*Tilletia caries* and *T. foetens*]. In this method, the artificially contaminated and then dusted seed-grain is germinated in small vessels in finely sifted earth and the grains removed from time to time, shaken free of earth, and then examined by washing in a drop of water for spore germination. The method was subsequently slightly modified by Winkelmann [*R.A.M.*, vi, p. 281] and by the author himself. The

latter now uses finely sifted earth moistened to a degree which is determined by preliminary tests to give the maximum spore germination. The inoculated treated seed is sown in this earth in glass dishes and germination of the bunt spores tested as before from the third or fourth day, adding a little cotton blue to the water used for washing in order to show up the germ-tubes and sporidia. For the testing of liquid disinfectants the use of 0·1 per cent. calcium nitrate solution is a valuable method of determining the germination of the spores [ibid., ii, p. 555], but it requires to be supplemented by tests of germination in earth in the presence of germinating seed as in the testing of dusts. For this purpose the treated seed-grain, after taking it from the disinfectant solution, is washed on a filter to remove the disinfectant, and the spores caught in the filter tested for germination in 0·1 per cent. calcium nitrate, while the seed-grain is reinoculated with some of the spores from the filter, dried, and sown in earth as before. The effect of the disinfectant on the germinability of the seed is separately tested. In determining the chemotherapeutical index [loc. cit.] the author prefers to determine a 'relative chemotherapeutical index' against a standard preparation of mercuric chloride.

Sandu-Ville (C.). **Contribuţiuni la studiul mălurii Grâului in România.** [Contribution to the study of Wheat bunt in Rumania.]—*Anal. Inst. Cerc. agron. Român.*, vi, pp. 324–352, 2 maps, 1934. [French translation. Received June, 1935.]

The results [which are tabulated] of an examination of samples of bunted wheat ears received from 148 localities in the chief wheat-growing provinces of Rumania showed that *Tilletia foetens* predominates in the Danube valley and occurs alone in the south Bessarabian and Moldavian steppe regions. *T. tritici* [*T. caries*] occurs mainly in the hilly lands in the west of the country with a continental type of climate resembling that of central and western Europe. The local occurrence of *T. caries* in the Danubian valley (e.g., in the neighbourhood of Bucharest) is probably due to its importation with foreign selected seed wheat. Further work is in hand to determine the existence, if any, of physiological strains of the two species of bunt.

Foëx (E.). **Quelques observations sur les maladies du pied des céréales.** [Some observations on the foot rots of cereals.]—*C.R. Acad. Agric. Fr.*, xxi, 12, pp. 501–505, 1935.

The long dry spell extending practically throughout the growing period of the French wheat crops in 1933–4 was generally unfavourable to the various agents of foot rot, but in the experimental plots of the Central Station of Plant Pathology heavy damage was caused by *Cercosporella herpotrichoides*, and to a lesser extent by *Ophiobolus graminis*, which reduced the yields by 71 and 39 per cent., respectively [*R.A.M.*, xiv, p. 26]. As already reported by various workers, the wheat grown in sterilized soil from the experimental plots was more virulently attacked by *O. graminis* than that in untreated soil [ibid., xiii, p. 503]. Vernalization did not appear to reduce the incidence of infection. In a series of inoculation experiments designed to confirm and supplement those previously undertaken [ibid., xiii, p. 568], *C. herpotrichoides*

infected nine species of *Triticum*, six of *Hordeum*, and one (very slightly) of *Avena* (*A. orientalis*). *O. graminis* also attacked all species of *Triticum* and *Hordeum*, four (very slightly) of *Avena* (*A. sativa*, *A. nuda*, *A. flavescens*, and *A. elatior*), rye (very slightly), maize, *Holcus saccharinus* [sorghum], and *Setaria germanica* [*S. italica*]. Of nineteen other Gramineae used in the trials with both parasites, only *Bromus schraderi* Kunth [*B. unioloides* H.B. & K.] proved susceptible to infection by *O. graminis*.

CHRISTENSEN (J. J.) & STAKMAN (E. C.). **Relation of Fusarium and Helminthosporium in Barley seed to seedling blight and yield.**—*Phytopathology*, xxv, 3, pp. 309–327, 4 figs., 1935.

This is an expanded and tabulated account of the writers' studies in Minnesota from 1932 to 1934 on the relative prevalence of *Fusarium* and *Helminthosporium* spp. in a large number of north-western barley samples grown in 1932 and 1933 and of the effect of these fungi on the succeeding crop, a preliminary note on which has already appeared [*R.A.M.*, xiii, p. 363]. *F. graminearum* [the conidial stage of *Gibberella saubinetii*] was the predominant species of *Fusarium* isolated from the diseased seed-grain, while *Helminthosporium* was mainly represented by *H. sativum* [ibid., xiv, p. 298], though many other species of each genus were detected. In 1932 *Helminthosporium* was three to four times more prevalent than *Fusarium*, and in 1933 the ratio of the former to the latter was still higher. Undetermined bacteria and fungi, however, especially *Alternaria* spp., were the chief agents of kernel discoloration. On the other hand, species of *Fusarium* and *Helminthosporium* were found to be responsible for most of the root rot, seedling blight, stunting or malformation, and coleoptile discoloration. The beneficial results of seed-grain treatment with ceresan were most conspicuous in the Velvet and Manchuria varieties and practically absent in Glabron and Minsturdi; in no case, however, can the use of disinfected material be recommended where clean, healthy seed is obtainable.

THOMAS (R. C.). **A bacteriophage in relation to Stewart's disease of Corn.**—*Phytopathology*, xxv, 3, pp. 371–372, 1935.

A bacteriophage is stated to have been isolated from the roots and lower nodes of maize plants in Ohio killed by *Aplanobacter stewarti* [see above, p. 596], from badly infected seed-grain, and from the lower nodes and pith of plants that had recovered from a temporary attack of Stewart's disease. After 24 hours' incubation at 25° C., inhibition was apparent in cultures of the organism on Bacto-nutrient broth to which 7, 14, or 20 drops of a filtrate from wilted plants were added. With the enhancement of activity of the phage through repeated passages, the amount of filtrate added to new cultures was gradually reduced to 3, 5, or 7 drops, and at the 38th passage inhibition was demonstrated at a dilution of 10^{-7}. Complete sterilization of the cultures was not effected even at the point of maximum activity of the phage filtrate. On potato-dextrose agar the modifications induced included variation in, or loss of, yellow colour, increase or decrease of viscosity of growth, and reduction or loss of virulence. In a comparative test with 18 lots of commercial seed-grain, part of which was soaked prior to sowing in lysed cultures of *A. stewarti* (24 hours in an ice-box at 50° F. followed by the same

period at room temperature), and the rest left untreated, the average incidence of infection in the treated plots was 1·4 per cent. as against 18 per cent. in the controls. A bacteriophage was frequently isolated from plants showing mild symptoms or in a state of apparent recovery.

CHRISTENSEN (J. J.) & JOHNSON (I. J.). **Field reaction of varieties and selfed lines of Corn to different collections of Ustilago zeae.**—*J. agric. Res.*, l, 1, pp. 47–57, 1935.

Continued comparative studies in 1931 and 1932 of the reaction of five standard varieties and ninety-five selfed lines of maize to infection with local and numerous other collections of smut (*Ustilago zeae*) under natural conditions in two different fields at University Farm, St. Paul, Minnesota [*R.A.M.*, xiv, p. 436] failed to reveal any significant differences in their relative responses to the various collections. The annual correlation coefficients between percentages of infection in replicates within each field with local and non-local collections, respectively, were essentially of the same magnitude as those of single replicates between the two fields. No statistically significant difference was found in the smut reactions of individual resistant lines grown in the two fields, and resistance in every case was the same to all the various collections tested; growth and environmental factors caused greater fluctuations in the infection percentages than did the different collections. It was clearly shown that lines resistant to local smut collections were resistant to collections from widely different sources. There was also clear evidence that lines of maize had a tendency to become infected at definite points (ear, sucker, and shoot), irrespective of the collection of smut used, and that the different collections did not influence the number of smut galls produced on each infected plant. There was, however, a high correlation between the number of galls per plant and percentage of smut infection. The size of smut galls was shown not to be the sole measure of resistance or susceptibility.

TYLER (L. J.) & SHUMWAY (C. P.). **Hybridization between Sphacelotheca sorghi and Sorosporium reilianum.**—*Phytopathology*, xxv, 3, pp. 375–376, 1 fig., 1935.

Crosses have been made at the University Farm, St. Paul, Minnesota, between the covered and head smuts of sorghum (*Sphacelotheca sorghi* [*R.A.M.*, xiv, p. 439] and *Sorosporium reilianum* [ibid., xiii, p. 436], respectively). Sorghum plants were inoculated with potato-dextrose broth cultures of single lines and paired combinations, the former giving negative results while the latter, after an incubation period of 7 to 10 days, produced on two lots of plants the chlorotic flecking commonly following inoculation with sexually compatible monosporidial lines of either smut. The sori and chlamydospores formed on the test plants were intermediate in type between those of *S. reilianum* and *Sphacelotheca sorghi*. As with the latter, the sorus tissue developed chiefly from the ovaries and adjacent floral parts, but the sori were much longer and less regular; in their leathery, white peridium and the abundant floral proliferation produced they resembled those of *Sorosporium reilianum*. The hybrid chlamydospores approximated in size to those of the latter smut and were faintly echinulate. The long, slender promy-

celia somewhat resembled those of *Sphacelotheca sorghi*, as also did the relatively few slender, tapering sporidia.

ATANASOFF (D.). **Virus diseases of Citrus.**—Reprinted from *Annu. Univ. Sofia* (*Fac. Agron.*), xiii, 42 pp., 6 figs., 1935.

In a brief introduction to this paper the author states that the chief aim of its publication is to draw the attention of phytopathologists to the striking similarity between a number of citrus diseases described in literature, especially those whose nature is not yet clearly understood, and some of the better understood virus diseases of other fruit trees and woody plants [*R.A.M.*, xiv, p. 462]. From a survey of the relevant literature he concludes that the earliest record of a virus disease on citrus is Trabut's short note in 1913 on a graft-transmissible infectious chlorosis of orange observed by him [presumably in Algeria] chiefly on a Washington Navel orange from England and a Siletta orange grown from a graft cutting imported from Australia. A study by the author, in January, 1935, of a diseased condition of lemon trees, widespread in groves along the eastern coast of Sicily and considered by the local growers to be 'mal secco' (*Deuterophoma tracheiphila*) [ibid., xii, p. 565], showed it to be very similar in its symptoms [which are described in detail] to Trabut's infectious chlorosis, with which the author identifies it, as well as with citrus blight [ibid., viii, p. 305].

The rest of the paper presents arguments which the author believes tell in favour of the virus nature of several other citrus diseases, including withertip (commonly attributed to *Gloeosporium limetticolum*), little leaf [ibid., xii, p. 90], die-back or exanthema [ibid., xi, p. 105], leprosis or scaly bark [ibid., xi, p. 26], decorticosis or shell-bark, psorosis [ibid., xiii, p. 692], brown spot of Navel oranges, peteca of lemons [ibid., ix, p. 304], crinkly leaf, and ring blotch and zonate chlorosis [ibid., xiii, p. 630], which are considered to be the same disease.

The paper terminates with a bibliography of fifty-nine titles.

BAKER (R. E. D.). **Gummosis of Citrus in Trinidad. I. 'Marsh' Grapefruit on sour Orange stock. II. The causal organism.**—*Trop. Agriculture, Trin.*, xi, 9, pp. 236–239, 3 graphs, 1934; xii, 2, pp. 36–42, 4 pl., 1 graph, 1935.

In the first of these two papers a brief account is given of a preliminary survey in 1934, the results of which showed that gummosis is widespread and in many cases severe in plantations of grapefruit (mostly of the Marsh variety) on sour orange (*Citrus aurantium*) stocks in Trinidad, especially where the average height of the graft union is not over 6 in. above the soil. In six of the fields examined, in which the graft union was less than 6 in. above the ground, the disease percentage varied from 28·5 to 78, whereas in three fields with higher unions it was only from 2 to 4 per cent. Other factors predisposing to gummosis are low forking of the trees, low branches touching the ground, low planting, poor drainage, and lack of proper cultivation. A brief discussion is also given of possible control measures based on these observations.

In the second paper details are given of the author's investigations of the condition, the results of which showed that it is due to two species of *Phytophthora* which were identified at the Imperial Mycological

Institute as *P. parasitica* [*R.A.M.*, xiv, p. 301] and a strain of *P. palmivora* in the 'cacao' group [cf. ibid., xiii, p. 77]. Observations indicated that *P. parasitica* is mainly responsible for gummosis in the field, while both species are equally important in the production of brown rot of the fruit. Neither of the two was capable of rotting cacao pods even when inoculated through wounds, but *P. parasitica* readily rotted lemons and eggplant fruits. *P. citrophthora* has not been found so far in Trinidad.

Reichert (I.) & Hellinger (E[sther]). **Penicillium rot of Oranges and the conditions affecting its appearance in Palestine.**—Reprinted from *Hadar*, vi, 4, 13 pp., 6 graphs, 1933. [Received May, 1935.]

Investigations into the conditions prevailing in Palestinian orange groves conducive to *Penicillium* rots [*P. digitatum* and *P. italicum*: *R.A.M.*, xii, p. 21] showed that the susceptibility of the fruits increased with age, that infection was more prevalent on light than on heavy soils and on the upper than on the lower part of the trees, and that spraying with Bordeaux mixture in one instance considerably reduced the loss from the disease.

Parker (E. R.). **Experiments on mottle leaf by spraying with zinc compounds.**—*Calif. Citrogr.*, xx, 4, pp. 90, 106–107, 2 figs., 1935.

Full details are given of further experiments in the Moreno Valley, near Riverside, California, in the control of mottle leaf of citrus [see next abstract] by treatment with zinc compounds [*R.A.M.*, xiii, p. 692]. As a result of the trials the following recommendations are made. Severely affected trees should be given a spray consisting of 10 lb. zinc sulphate (25 per cent. zinc) and 5 lb. hydrated lime to 100 galls. water, while in moderate or mild cases a 5–2½–100 formula should suffice. Both mixtures should be supplemented by blood albumin in dry or liquid form at the rate of 4 oz. per 100 galls. as a spreader. Satisfactory results were obtained with a 'light' spray giving only one-third of the normal coverage.

Reed (H. S.) & Dufrénoy (J.). **Modification in cell structure accompanying mottle leaf of the Orange.**—*Amer. J. Bot.*, xxii, 3, pp. 311–328, 10 figs., 1935.

In this further account of their studies of the alterations in the cells of orange leaves from trees affected with the mottle leaf disease [*R.A.M.*, xiv, p. 302 and preceding abstract], the authors mention that buds on affected shoots developed more slowly than those on normal ones. The differentiation of meristematic into specific tissue cells was delayed, and even in early stages the cells produced an increased amount of phenolic compounds antagonistic to carbohydrate synthesis. The palisade cells in the leaf primordia divided normally and produced enlarged cells containing a few chloroplasts of reduced photosynthetic capacity; numerous fat globules were present in the cytoplasm and plastids. The osmotic strength of the vacuoles was apparently below normal in the palisade cells, which were rapidly penetrated by neutral red and Nile blue A; they are about twice normal width and were often divided transversely into rhomboidal cells with few, if any, chloroplasts. The vacuolar

sap was sufficiently acid (at least P_H 4) to keep iron salts in solution both in mottled and normal leaves.

STEYAERT (R. L.). **Observations sur la stigmatomycose des capsules du Cotonnier au Congo Belge.** [Observations on stigmatomycosis of Cotton bolls in the Belgian Congo.]—*Bull. agric. Congo belge*, xxv, 4, pp. 473–493, 1 graph, 1934.

A full account is given of a detailed study made to obtain statistical data as to the seasonal development of internal boll disease (stigmatomycosis) of cotton in the Belgian Congo and to determine the critical period of infection. The investigation was limited to bolls showing no outward sign of necrosis, in which infection had taken place through insect punctures.

After listing the known hosts of the fungi associated with the disease in different countries and their insect vectors, the author states that the fungus chiefly present locally was *Nematospora coryli*, *N. gossypii* being much less abundant. The former had much larger spores (37 to 48 by 2·5 to 3 μ) than the type species and resembled a strain isolated by Ashby from Cauto cotton in Jamaica [cf. *R.A.M.*, v, p. 389]. The local alternate hosts of *N. coryli* and *N. gossypii* include *Centrosema plumieri* (widely used in the Belgian Congo for shade and green manuring), *Phaseolus lunatus*, cowpea, and soy-bean. At Stanleyville the author observed *P. lunatus* infected by *N. coryli*, *N. gossypii*, and *Spermophthora gossypii*.

Three forms of internal boll rot are distinguished, viz. stigmatomycosis caused by the fungi under discussion; a red rot believed to be of bacterial origin [ibid., xiv, p. 223], producing a red discoloration of the lint and hypertrophy of the central placenta; and a condition resembling *Nematospora* infection but also, apparently, of bacterial origin. The importance of attacks of stigmatomycosis increases with increasing lateness of sowing [loc. cit.], but the other forms of internal boll rot are unaffected by seasonal factors.

LIKHITE (V. N.) & DESAI (G. H.). **Starch accumulation in stenosised Cotton plants.**—*Curr. Sci.*, iii, 8, p. 356, 1935.

Examination of cotton plants growing at Baroda and affected by stenosis or smalling [*R.A.M.*, iii, p. 272] showing that, on a dry weight basis, the leaves contained 17·5 per cent. starch, as against only 11 per cent. for healthy leaves. Starch had also accumulated in the vascular bundles of the petioles and the stems and roots, but not in the healthy branches, of diseased plants.

POISSON (R.) & PATAY (R.). **Beauveria doryphorae n.sp., muscardine parasite du Doryphore : Leptinotarsa decemlineata Say (Coleoptère chrysomélide).** [*Beauveria doryphorae* n.sp., a muscardine parasitic on the Colorado Beetle: *Leptinotarsa decemlineata* Say (a chrysomelid Coleoptera).]—*C.R. Acad. Sci., Paris*, cc, 11, pp. 961–963, 1935.

A new species of *Beauveria*, to which the name of *B. doryphorae* is given, has been observed parasitizing laboratory cultures of the Colorado beetle, *Leptinotarsa decemlineata*, in France. Infection spreads rapidly

both among imagos and nymphs and has also been induced by the artificial inoculation of eggs and young larvae with the oval conidia of the fungus (2 by 1·8 μ), which are borne on stout phialids, the two elements together forming glomerules about 30 μ in diameter. The fungus produces on Sabouraud's, blood, or beef bouillon agar dense, white, velvety colonies, assuming a chalky aspect (which is communicated to the infected insects) with the development of the fructifications. *L. decemlineata* being virtually without natural enemies, at any rate in the west of France, further attempts will be made in 1935 to propagate the new *Beauveria*.

Drechsler (C.). **Some non-catenulate conidial Phycomycetes preying on terricolous amoebae.**—*Mycologia*, xxvii, 2, pp. 176–205, 5 figs., 1935.

After an introductory discussion on the nature, functions, and classification of some Phycomycetes predaceous on amoebae in laboratory cultures from diseased rootlets and other vegetable refuse [*R.A.M.*, xiv, p. 360 and next abstracts], the writer gives Latin and English diagnoses of two further genera of this order, viz., *Acaulopage*, represented by five, and *Stylopage*, by three species. Some of these fungi were described summarily in 1933 [ibid., xii, p. 761] but were not named. They are considered to belong, like the recently described genus *Zoopage* and its allies, to a distinct group of the Phycomycetes, termed the Zoopagaceae. Both are characterized by a spreading mycelium and by continuous, hyaline, somewhat sparsely branching hyphae, capturing minute animals by means of yellow adhesive material, penetrating the pellicle or integument of each by a lateral branch giving rise within the host to a branched haustorium that exhausts the protoplasm; in *Acaulopage* aerial, erect hyaline conidia arise at intervals from prostrate hyphae while in *Stylopage* a single hyaline conidium is borne at the apex of an erect fertile hypha, or following repeated elongation several may be produced in succession; in both genera globose zygosporangia are formed in the substratum from the union of two similar hyphae. Attempts to isolate these fungi and grow them in pure culture have failed.

Drechsler (C.). **A new species of conidial Phycomycete preying on nematodes.**—*Mycologia*, xxvii, 2, pp. 206–215, 1 fig., 1935.

Latin and English diagnoses are given of *Stylopage hadra* sp.nov. [cf. preceding abstract], occurring in soil (especially leaf mould) and decaying plant refuse, capturing and consuming nematodes (*Rhabditis*, *Cephalobus*, *Diploscapter*, *Diplogaster* [*R.A.M.*, xii, p. 762], *Acrobeles*, and *Acrobeloides*) near Washington, D.C., followed by some observations on the taxonomy of the fungus.

Drechsler (C.). **A new Mucedinaceous fungus capturing and consuming Amoeba verrucosa.**—*Mycologia*, xxvii, 2, pp. 216–223, 1 fig., 1935.

Latin and English diagnoses are given of *Dactylella tylopaga* sp.nov., occurring in leaf mould, capturing and consuming, by means of ovoid or ellipsoid, adhesive, yellowish protuberances, *Amoeba verrucosa* near Washington, D.C. [*R.A.M.*, xii, p. 761], together with a summary of the

considerations dictating the writer's preference for the name *Dactylella* over the equivalent *Monacrosporium* [ibid., xiii, p. 509].

DE CHIARA (C.). **Contributo allo studio dell'etiologia del mughetto dei lattanti a Roma.** [A contribution to the study of the etiology of thrush among nursing infants in Rome.]—*G. Batt. Immun.*, xiii, 6, pp. 993–1002, 1934. [English and German summaries.]

Morphological and biochemical studies on thirteen fungal strains isolated from thrush among nursing infants in Rome indicated that eleven belonged to *Mycotorula* (*Monilia*) [*Candida*] *pinoyi* [*R.A.M.*, x, p. 790; xiv, p. 308] and two to *M.* [*C.*] *bronchialis*.

MOORE (M.) & KILE (R. L.). **Pityrosporum ovalis as a causative agent of seborrheic dermatitis.**—*Science*, N.S., lxxxi, 2098, pp. 277–278, 1935.

Human patients, rabbits, and guinea-pigs reacted positively to inoculation with pure beerwort agar cultures of *Pityrosporum ovale* [*R.A.M.*, vi, p. 95; vii, p. 325] in varying proportions according to the method of infection, indicating that the organism may be a factor in the production of seborrhoeic dermatitis under favourable conditions. Previous investigators have been unable, owing to failure to cultivate the organism on artificial media, to prove the parasitism of this fungus [but see ibid., xii, p. 442].

MACKINNON (J. E.). **Estudo del primer caso uruguayo de cromoblastomicosis y 'revista critica' sobre la enfermedad.** [A study of the first Uruguayan case of chromoblastomycosis and a 'critical review' of the disease.]—*Arch. urug. Med.*, v, 2, pp. 201–226, 8 figs., 1934.

Clinical, morphological, and cultural details are given of the first Uruguayan case of chromoblastomycosis due to *Phialophora verrucosa* [*R.A.M.*, xiv, p. 100] in a white native of the country. The lesions on the patient's right hand resembled those of sporotrichosis from a histopathological point of view. The disorder described by Montpellier and Catanei from North Africa as due to *Hormodendron algeriensis* [ibid., vii, p. 639; xiv, p. 168] is considered to be a form of chromoblastomycosis, which may also be induced by *Trichosporium pedrosoi* [ibid., xiv, p. 100]. So far the known distribution of chromoblastomycosis is as follows: twenty-one cases in Brazil and one each in Paraguay and Porto Rico (*T. pedrosoi*); two in the United States and the present one in Uruguay (*P. verrucosa*); and one in North Africa (*H. algeriensis*). The disease has further been reported from Costa Rica, Russia, and East Africa (one case each) but without any definite attribution.

LEWIS (G. M.). **Fluorescence of fungus colonies with filtered ultraviolet radiation (Wood's filter); an aid in determination of species: preliminary report.**—*Arch. Derm. Syph., N.Y.*, xxxi, 3, pp. 329–332, 1935.

Certain fungi growing on Sabouraud's dextrose medium (P_H 5) were found to exhibit characteristic individual fluorescent colorations when viewed in filtered ultra-violet radiation (Wood's filter), the phenomenon

being most conspicuous during the first three weeks of development in primary cultures [cf. *R.A.M.*, xii, p. 218]. The method appears to be particularly useful in the rapid differentiation of *Microsporon lanosum* and *M. audouini*, but was also applicable to other organisms, e.g., *Epidermophyton inguinale* [*E. floccosum*: ibid., xiii, p. 237], *Trichophyton interdigitale* [*T. mentagrophytes*: ibid., xiv, p. 105], *T. cerebriforme* [ibid., xiii, p. 511], and *T. gypseum* [ibid., xiii, p. 768].

WILLIAMS (J. W.). **Effect of age of a specific medium on morphology of colonies of certain pathogenic fungi.**—*Proc. Soc. exp. Biol.*, xxxii, 6, pp. 918–920, 1935.

The growth changes in a number of human pathogens planted on a peptone-dextrose-agar medium at P_H 5·6 in varying stages of ageing up to ninety days at room temperature are described. Weighing experiments covering the period of the study showed that the medium lost an average of 8·6 mg. per gm. per diem, involving a loss of 7·363 gm. water by the end of ninety days, with a consequent increase of nearly $4\frac{1}{2}$ times in the concentration of ingredients. The medium may, however, safely be left for some ten weeks in the laboratory without losing any of its capacity to bring out the individual characters of a given fungus.

KITABATAKE (E.) & LIU (K. P.). **A case of pneumonomycosis aspergillina.**—*J. orient. Med.*, xxii, 3, pp. 497–505, 1 pl., 1935. [Japanese, with English abstract on p. 43.]

An undetermined species of *Aspergillus* was found to be responsible for necrosis of the lung parenchyma [cf. *R.A.M.*, xi, p. 181] in a 23-year-old male native of Manchukuo, this being apparently the first record of pneumomycosis in the region under observation or in Japan.

POLLACCI (G.). **Sopra una nuova specie di micete commensale (Phoma hominis Agostini et Tredici), isolato da forme cliniche del derma.** [On a new species of commensal fungus (*Phoma hominis* Agostini & Tredici), isolated from clinical forms of skin disease.]—Reprinted from *Atti Ist. bot. Univ. Pavia*, Ser. IV, vi, 3 pp., 1935.

After referring to various cases in which the new species *Phoma hominis* (which is being described by Agostini and Tredici) has recently been found in Italy in association with human diseases (including granuloma of the foot, dermatomycosis of the hand, ozaena, otomycosis, and subacute and vasomotor rhinitis), the author gives a brief description of some of the characters of the fungus. In culture it grows rapidly on all the usual media, forming white, flocculent colonies which later turn grey and become pink in the part adhering to the medium, finally assuming a dark brown, crusty appearance. The pycnidia develop from small yellowish-brown stromata and are brown and filled with round or elliptical, hyaline pycnospores, measuring 2·5 to 12·5 μ in diameter. There is also an *Alternaria* stage [cf. *R.A.M.*, xi, p. 374] characterized by irregularly shaped, variously septate, yellowish or brownish conidia, 5·13 to 25·6 μ long, arranged singly or in short chains.

In the clinical forms studied the fungus occurred only as a sterile, vegetative mycelium. Inoculations of laboratory animals failed to establish its pathogenicity.

JUNGHERR (E.). **Mycotic affections of the bovine reproductive system.**—*J. Amer. vet. med. Ass.*, lxxxvi, 1, pp. 64–75, 9 figs., 1935.

Clinical notes are given on some mycotic disorders of the bovine reproductive system recently observed at the Storrs (Connecticut) Agricultural Experiment Station, together with cultural and morphological details of the fungi involved, which were identified as *Aspergillus fumigatus*, *A. niger*, *Rhizopus cohnii* Berl. & de Toni, and *Mucor pusillus* [*R.A.M.*, xiii, p. 442]. The etiological significance of the infections was substantiated by the correlation between breeding and laboratory data in individual cases, but they appear to be of relatively slight importance from the standpoint of epizootic contagion in the herd. All the fungi except *A. niger* proved pathogenic to rabbits.

THOMPSON (M. A.). **The active constituents of ergot: a pharmacological and chemical study.**—*J. Amer. pharm. Ass.*, xxiv, 1, pp. 24–38; 3, pp. 185–196, 11 graphs, 1935.

An account is given of extensive pharmacological and chemical studies on the active constituents of ergot of rye [*Claviceps purpurea*: see next abstract]. The observed efficacy of the aqueous extracts of ergot must reside in some hitherto unknown, highly important active principle other than ergotoxin and ergotamin [*R.A.M.*, xiv, p. 362], since the latter are not freely extractable in water but only in alcoholic solutions. This new alkaloid has been shown by animal experiments to be closely related to the two above-mentioned constituents, from which it differs mainly in its much more soluble nature and its more prompt and powerful oxytocic action following oral administration.

The non-specific amino bases of ergot, such as histamin, tyramin, cholins, and the like, were found to contribute nothing of value to the characteristic oxytocic activity of the drug.

DUDLEY (H. W.) & MOIR (C.). **The substance responsible for the traditional clinical effect of ergot.**—*Brit. med. J.*, *1935*, 3871, pp. 520–523, 2 graphs, 1935.

In 1932 the second-named author demonstrated that liquid extract of ergot [*Claviceps purpurea*] B.P. 1914 contained a substance with a powerful action on the human uterus quite unlike that of ergotoxin and resembling that of histamin. The writers have now isolated from 10 kg. defatted ergot 0·82 gm. of a crystalline alkaloid having this clinical effect. The substance, to which the name 'ergometrine' is applied, is moderately soluble in chloroform, benzene, and dichlorethylene, very soluble in ethyl and methyl alcohols, acetone, and ethyl acetate, appreciably soluble in cold water [see preceding abstract], to which it imparts a reaction alkaline to litmus, and dissolves readily in dilute acids. It gives the dimethylamino-benzaldehyde and glyoxylic acid colour reactions common to the known alkaloids; its melting-point lies between 150° and 152° C. These properties distinguish ergometrine from all the ergot alkaloids hitherto described, including the newly discovered ergoclavin [*R.A.M.*, xiv, p. 93] and sensibamine (*Edinburgh med. J.*, xli, 1934), which partake of the nature of ergotoxin and ergotamin.

WATANABE (T.). **A new species of Ascochyta on Ramie.**—*Bull. Utsunomiya agric. Coll.*, ii, 2, pp. 27–42, 2 pl., 1935.

A tabulated account is given of the writer's morphological, physiological, and cultural studies on a serious disease of ramie (*Boehmeria nivea*) first observed at the Utsunomiya (Japan) Agricultural College in June, 1930.

Infection proceeds from the base upwards, the upper leaf surfaces developing linear, semicircular, ellipsoidal or irregular, pale green, later greyish-brown or darker spots, 2 to 40 mm. in diameter, often coalescent, and ultimately causing shrivelling and dropping of the foliage. On the petioles the lesions are fusiform or irregular and deeply sunken, causing defoliation, while those on the stems are fusiform or striate, pale yellowish-green to dark brown, conspicuously depressed, and finally involving the wilting or death of the whole plant. The most susceptible varieties are Chosen and Akouhi, followed by Hakuhi, Yamagata, Beikoku, Izu-Kairyo, and Seishin, whereas Tainan-Kokuhi is resistant and Sei, Kagisan, Kagisei, Saren, and Kōkwa moderately so.

The hyphae of the causal fungus, which is named *Ascochyta boehmeriae* Watanabe, with English and Latin diagnoses, are hyaline (later brown), and 2·2 to 6·6 μ in width on the host (2·2 to 11 μ in culture). Chlamydospores were formed in profusion on apricot and potato decoction agars. The subepidermal, later erumpent, ostiolate, gregarious or scattered, globose or subglobose, bright yellow pycnidia are 82·5 to 148·5 μ (mostly 115·5 to 132 μ) in diameter, and contain ovoidal, ellipsoidal, cocoon-shaped, straight or slightly curved, hyaline, uni- or occasionally biseptate pycnospores, 6·25 to 13·75 by 2·50 to 3·75 μ (average 7·50 by 3·75 μ). The minimum, optimum, and maximum temperatures for growth were below 5°, 25°, and 30° to 34° C., respectively. Positive results were given by inoculation experiments with spore suspensions of the fungus on *B. nivea* and a number of wild related plants, viz., *B. tricuspis* Makino, *B.* sp. (Wo-Yabumawo), *B. japonica* Miq. var. *platanifolia* Maxim., *B.* [*Villebrunea*] *frutescens* (Thunb.) Blume var. *concolor* Nakai, and *B. sieboldiana* Blume [*B. platyphylla* D. Don.], but tests on mulberries gave negative results. The incubation period of the disease ranged from 5 to 15 days. The fungus underwent no diminution of virulence as a result of six months' storage in and outdoors and in the soil.

REITER (K.). **Eine zu wenig bekannte Nelkenkrankheit.** [A too little known Carnation disease.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 10, pp. 118–119, 1935.

Outdoor Agadir carnations in the Lössnitz district of Saxony were extensively and severely attacked in 1934 by *Fusarium poae* [*R.A.M.*, xi, p. 737]. The organism is believed to live in a kind of symbiotic association with the mite *Pediculoides dianthophilus*, the latter conveying the spores into the interior of the flower buds and subsequently profiting by the nutritional facilities afforded by the fungal rotting. *F. poae* also occurs on meadow grasses, notably *Poa pratensis*, in company with its symbiont, producing a whitening of the panicles. The affected carnations, which showed a greyish-white rotting of the petals,

were growing on meadowland that had been dug and put into cultivation a year earlier. Obviously the fungus, which is capable of subsisting for many years in the soil, was disseminated from the grasses by the cultural operations, aggravated by the scattering of diseased refuse between the beds. *F. poae* is stated to have hitherto been known to attack only greenhouse carnations. Soil disinfection with 1 per cent. formalin is indicated.

TAYLOR (MARY R. F.). **The origin of Botrytis disease outbreaks on Lilium candidum.**—*ex* Lily Year Book 1934, London, Royal Hortic. Soc., pp. 82–89, 3 figs., 1934.

A study of the origin of outbreaks of the disease of *Lilium candidum* caused by *Botrytis elliptica* [*R.A.M.*, xiii, pp. 165, 705] showed that at 65° F. a relative atmospheric humidity of 97·7 was necessary to induce conidiophore production; at 80° an almost saturated atmosphere was required. The conidiophores protruded only when the leaf surfaces at the beginning of the experiment were moist. Under optimum conditions, the conidia emerged in seven hours, ripe spores being produced two hours later and germinating in water within a further two hours. Actual precipitation, producing a film of water on the foliage, is essential for spore formation, which occurs under optimum conditions in twelve hours. If the film remains, new leaves become infected. Spore production may continue in dry weather if the leaves remain wet, the spores retaining their viability for several months.

GREEN (D. E.). **Decay of Lily bulbs during storage.**—*ex* Lily Year Book 1934, London, Royal Hortic. Soc., pp. 79–81, 1934.

Three consignments of *Lilium longiflorum giganteum* and *L. speciosum rubrum* bulbs packed in a cement-like casing of fine earth were found on arrival in England from Japan to be almost entirely rotted, only one small consignment, packed more loosely, being in good condition. From the decayed scales a *Fusarium*, an *Aspergillus*, and eight bacteria were isolated, inoculations with which into healthy scales of *L. longiflorum giganteum* bulbs at 78° F. under dry and moist conditions gave negative results. Many affected scales yielded no organism. Of two other cases of similarly tightly packed bulbs one contained only rotted bulbs, but in the other a few sound or partially sound bulbs were found in each corner, and the others showed a less extensive decay. Many bulbs, though not rotten, were dead, and had a greyish-brown, greasy appearance.

A rough test was carried out, healthy *L. longiflorum giganteum* bulbs being placed in jars of air, and of strong carbon dioxide, respectively, sealed, and kept at 70°. In one set the atmosphere was dry, and in another, wet. The bulb in the damp carbon dioxide assumed the typical greyish-brown appearance in fourteen days, and that in the dry carbon dioxide later; the bulbs in normal air remained sound for many weeks.

It is concluded that the death of the bulbs was due primarily to the accumulation in and about them of carbon dioxide owing to the tight packing, the organisms found being present only as saprophytes.

Dowson (W. J.) & D'Oliveira (M.). **On the occurrence of Aplanobacter rathayi E. F. Smith on Dactylis glomerata in England.**—*Ann. appl. Biol.*, xxii, 1, pp. 23–26, 1 pl., 1935.

A brief description is given of a bacterial disease of cock's-foot grass (*Dactylis glomerata*) which the authors observed in 1934 in Cambridgeshire, and the general symptoms of which were a partial or complete destruction of the spikelets which were covered by a bright yellow bacterial slime. Isolations from the diseased plants yielded an organism agreeing exactly in its cultural and growth characters with *Aplanobacter* [*Bacterium*] *rathayi* [*R.A.M.*, xii, p. 571]. The disease was artificially reproduced by inoculating healthy shoots of *D. glomerata* with the naturally occurring slime from affected plants, but no infection resulted when the plants were inoculated with cultures of the organism on artificial media. This is stated to be the first definite record of *Bact. rathayi* from England, although it is believed that the disease has been present there unrecognized for some time, and that it is being constantly introduced with imported Danish seed of the grass [ibid., xii, p. 294].

Rădulescu (E.). **Influență atacului ruginii (Puccinia phlei-pratensis Erikss. et Henn.) la Phleum pratense.** [Effect of rust (*Puccinia phlei-pratensis* Erikss. & Henn.) attack on *Phleum pratense*.]—*Anal. Inst. Cerc. agron. Român.*, vi, pp. 314–323, 3 figs., 1 graph, 1934. [German summary. Received June, 1935.]

Observations made by the author during heavy natural epidemics of timothy (*Phleum pratense*) rust (*Puccinia phlei-pratensis*) [*R.A.M.*, ix, p. 459] in 1932 and 1933 at the Plant Breeding Station in Cluj [Klausenburg], Rumania, showed that twenty-six of the sixty strains (clones) of the grass grown in adjacent plots were highly resistant to completely immune; the yield in green substance of these strains in 1933 varied from 4·1 to 9·2 kg. per plot, as compared with yields ranging from 1 to 3·7 kg. of the susceptible clones, which were severely rusted in both years. There was also clear evidence that the rust reduced the tillering capacity of the susceptible clones, somewhat retarded their early growth in the spring, and impaired their regeneration after mowing. These results suggest the advisability of testing the rust resistance of timothy lines before adopting them for extensive sowing.

Drechsler (C.). **A leaf spot of Bent Grasses caused by Helminthosporium erythrospilum, n.sp.**—*Phytopathology*, xxv, 3, pp. 344–361, 7 figs., 1935.

Leaf spot of redtop (*Agrostis alba*), due to a previously unnamed species of *Helminthosporium* to which the name *H. erythrospilum* is now given, is widespread in parts of the eastern and middle-western United States [*R.A.M.*, iv, p. 418]. In wet weather the fungus causes localized, dull reddish-grey lesions. Under dry conditions discoloration is less evident, and the foliage often withers in a manner suggestive of drought injury. Seaside bent (*A. palustris*) also suffers severely from the same parasite and lesions unaccompanied by withering are caused by it on colonial bent (*A. tenuis*). *H. triseptatum* Drechsl., a less destructive pathogen than the species under discussion, produces small, pale spots

surrounded by a salmon-coloured zone on *A. alba,* and *H. giganteum* [ibid., ix, p. 39] causes zonate lesions on *A. palustris.*

H. erythrospilum forms conidia freely on maize-meal agar and other culture media. It belongs to the series of forms with ascigerous stages referable to *Pyrenophora* [ibid., xiv, p. 125] and including *H. gramineum, H. dictyoides* (a parasite of *Festuca elatior*) [ibid., vi, p. 272], *H. siccans* (pathogenic to *Lolium perenne* and *L. multiflorum*), and *H. avenae,* from which it was found to differ in its smaller and more closely septate conidia. From *Drechslera* (*H.*) *arundinis,* the agent of a leaf spot of *Arundo donax* in Japan [ibid., x, p. 262], the new species is distinguished by the abrupt rounding of its conidia at both ends, and by the position of the hilum within the basal segment. In pure culture the redtop fungus often produces more numerous and much smaller submerged sclerotia than those formed on artificial media by *H. bromi* [ibid., iii, p. 65] or the *Pyrenophora,* having ascospores with typically five transverse septa, that occurs in profusion on overwintered oat-straw in the Middle Atlantic States. It is characterized by erect, brown or fuliginous, simple or occasionally branched, geniculate, 1- to 10-septate conidiophores, 75 to 275 by 6 to 9 μ, bearing at successive intervals (beginning 75 to 125 μ from the base) yellowish to pale olivaceous, straight or sometimes slightly curved, subcylindrical, 2- to 10-septate conidia, abruptly rounded at the ends, 25 to 105 by 8 to 16 μ (average 65 by 12·3 μ), and individually including the non-protruding hilum within the basal contour. English and Latin diagnoses of *H. erythrospilum* are given.

Peltier (G. L.) & Tysdal (H. M.). **Wilt and cold resistance of self-fertilized lines of Alfalfas.**—*Res. Bull. Neb. Agric. Exp. Sta.* 76, 26 pp., 1 fig., 1 diag., 1 graph, 1934. [Received May, 1935.]

Considerable details are given of the authors' studies, started in 1928, of the reaction of a large number of inbred lines of lucerne, from plants both long cultivated in Nebraska and imported, to winter injury and to bacterial wilt (*Aplanobacter insidiosum*) [*R.A.M.*, xii, p. 636; xiv, p. 174] under controlled conditions. Preliminary tests indicated that re-inoculating lucerne stands that had survived a previous inoculation with the organism served to eliminate further susceptible individuals, the percentage of which, however, was consistently much lower in the second than in the first test. The results of the main investigation showed that selfing the lucerne lines without subjecting them to elimination through wilt infection resulted in a decrease of wilt resistance in the successive generations. Elimination of cold-susceptible seedlings by exposing them to artificially induced freezing led to a slightly increased resistance to wilt in the selfed progeny, whereas wilt elimination more definitely increased cold resistance. In both cases the result was probably due to elimination of the less vigorous plants. Elimination through wilt resulted in self-fertilized lines maintaining the resistance of highly resistant parents or in increasing the resistance of moderately resistant ones. There was clear evidence of the existence of a marked inheritance of wilt resistance, depending on more than one, possibly three factors. Some individuals were observed to exhibit high resistance to both wilt

and cold, but their progenies appeared to segregate independently for these two characters, the data so far collected indicating that more than one factor are involved in the inheritance of cold resistance.

Preliminary results of attempts at hybridization of desirable individuals indicated promising possibilities of thus building strains resistant to wilt and to cold.

EDWARDS (E. T.). **Witches' broom—a new virus disease of Lucerne.**—*J. Aust. Inst. Agric. Sci.*, i, 1, pp. 31–32, 1935.

Witches' broom of lucerne [*R.A.M.*, ix, p. 93], commonly known as 'spindle shoot', 'mistletoe', 'bunchy top', or 'kurrajong', is stated to have been known to New South Wales growers for the last twenty-five to thirty years, but only since 1931 have investigations been in progress on its origin, in which a virus is strongly suspected to be concerned. In recent tests the disease was transmitted by grafting only, negative results being obtained with mechanical inoculation, massed populations of potential insect vectors, and infected seed. The disease is characterized by marked dwarfing of the plant, a profusion of shoots from the crown, slender stems, small, erect, bunchy, abnormally rounded, chlorotic, and puckered leaves, and partial or complete absence of flowers. Seed is rarely produced. Phyllody has frequently been observed. Witches' broom is stated to be widespread throughout the extensive inland grazing areas of New South Wales, field infections of 20 to 25 per cent. being common and 60 to 70 per cent. of the plants in old stands occasionally being affected. In a two-year test under normal field conditions, the diseased plants yielded at each cutting 37·4 per cent. less weight of green fodder than healthy ones.

HIRATSUKA (N.) & TOBINA (E.). **Studies on Uromyces parasitic on Japanese species of Lespedeza and Microlespedeza.**—*Ann. phytopath. Soc. Japan*, iv, 3–4, pp. 145–171, 1935. [Japanese, with English summary.]

A tabulated account is given of the writers' experimental studies on the group of *Uromyces* forms parasitizing thirteen species of *Lespedeza* and one of *Microlespedeza* [which are listed] in Japan. It is concluded that all the rusts involved may be referred to two species, viz., the collective *U. lespedezae-procumbentis* [*R.A.M.*, vii, p. 61] on the species of *Lespedeza*, and *U. itoanus* Hiratsuka n.sp. on *M. striata* Mak. (and *M. stipulacea* Mak. in Manchuria). *U. itoanus* [a Latin diagnosis of which is given] is characterized by scattered or gregarious, minute, pale brown to cinnamon-coloured uredosori; subglobose, ellipsoidal, or obovate, echinulate uredospores, 21 to 30 by 15 to 24 μ; numerous clavate, straight or curved paraphyses, 35 to 60 by 8 to 18 μ (at the apex); minute, blackish-brown or black teleutosori; and ellipsoidal, oblong, or clavate, rarely obovate teleutospores, 27 to 48 by 12 to 24 μ, with a persistent hyaline or subhyaline pedicel up to 84 μ in length. Inoculation experiments with uredospores of *U. itoanus* gave positive results only on *M. striata*, none of the species of *Lespedeza* tested contracting infection.

Lutte contre les parasites des arbres fruitiers. Calendrier des traitements. [Campaign against fruit tree parasites. Calendar of treatments.]—*Bull. Direct. Agric. Rabat*, 10, 1 chart, 10 figs., 1935.

This is a clear representation of the official schedules of the treatment of oranges and other citrus fruits, apples and pears, peaches and almonds, and apricots and plums against insect pests and fungous diseases in Morocco. The seasons of the year and corresponding stages in the growth of the trees are shown in red and the names of the parasites and appropriate treatments in heavy black type.

LOEWEL (E. L.). **Die Obstbaumspritzung im Altenland.** [Fruit tree spraying in the Altenland.]—*Tech. in d. Landw.*, xvi, 3, pp. 57–59, 4 figs., 1935.

In connexion with an account of the technical aspects of spraying against insect and fungal pests in the orchards of the Altenland district of Germany, with special reference to the control of apple and pear scab (*Fusicladium*) [*Venturia inaequalis* and *V. pirina*: *R.A.M.*, xiv, p. 371], it is stated that nearly all the commercial growers are now in possession of motor-driven apparatus, which at present number about 700 in the Lower Elbe valley as against 100 to 150 six years ago. At the present time the cost of a machine of appropriate capacity is about M. 1,000 compared with M. 1,700 on the first introduction of this type of apparatus. On an average the amount (in litres) of a liquid fungicide to be applied to a tree is reckoned at slightly less than its age; 25 l. may be recommended for one of twenty to thirty years old. The average pressure of the 5 to 6 h.p. apparatus in general use is 25 to 30 atm. It is estimated that some 180 trees can be conveniently treated daily.

HOETTE (SHIRLEY). **Transport and ripening of Bananas.**—*Fruit World, Melbourne*, xxxvi, 3, pp. 133, 135, 1935.

Brief, popular notes are given on the following diseases attacking bananas during transport in Australia, viz., the black end-rot due to *Gloeosporium musarum* [*R.A.M.*, xii, p. 40; xiv, p. 427], that due to *Nigrospora musae*, stem-end rot (*Thielaviopsis* [*Ceratostomella*] *paradoxa*), squirter disease (*N. musae*) [ibid., xiii, p. 43], and a previously unrecorded *Phytophthora* rot. The last-named, which is not at present of economic importance, is characterized by a very early water-soaking and blackening of the stalk end, developing after only two days in the ripening room. Later, the blackening spreads half-way down the fruit, and a very unpleasant odour is emitted. The flesh feels soft, is grey and cheesy in appearance, and very tough in texture. The vascular strands turn purple, this colour being repeated in a central streak along the distal end of the fruit. The cells in the rotted tissue retain their starch grains intact. Experimental evidence showed that the fungus interfered with diastase activity. Further work on this disease is in progress.

CHEEMA (G. S.) & DANI (P. G.). **Report on the export of Mangoes to Europe in 1932 and 1933.**—*Bull. Dep. Ld Rec. Agric. Bombay* 170 of *1932* (revised 1934), 31 pp., 14 pl. (1 col.), 1935.

Particulars are given of the work connected with the export of mangoes from India to Europe in 1932 and 1933, which is discussed in rela-

tion to the following chief factors governing successful commerce in this fruit: (1) selection of suitable varieties for export; (2) correct stage of maturity at picking time; (3) right storage temperature during transit; and (4) proper methods of packing [cf. *R.A.M.*, xiii, p. 387].

Seven samples of rotted fruits from the London consignments were examined at the Imperial Mycological Institute, Kew. One showed the presence of *Gloeosporium mangiferae*, the conidial stage of *Glomerella cingulata* [ibid., xi, p. 793; xiv, p. 46]. Three were affected by a black, wrinkled rot advancing from the stem-end into the fruit; the skin was dotted with black, exposed stromata containing pycnidia with fusiform, continuous, hyaline pycnospores, 7·5 to 11 by 2·8 to 4 μ in diameter, apparently belonging to a *Phomopsis* [ibid., iii, p. 122] with A spores only. One of these fruits was simultaneously infected by a blue *Penicillium* and by *Cladosporium herbarum*. The fungus causing a firm, black, mummified type of decay in the remaining three fruits was characterized by tendrils of oval, continuous, hyaline spores, considerably larger than those of the related *Dothiorella mangiferae* Syd. Its cultural characters, including the wine-red pigmentation of the medium on Dox's agar, were suggestive of the pycnidial stage of *Botryosphaeria ribis* var. *chromogena* [ibid., ix, p. 344] (*D. ribis*), recorded on mango in Hawaii. The spores, however, were somewhat too broad for that species.

Three kinds of physiological disorders appeared to be responsible for wastage in the shipments, viz., a relatively superficial blemish in the shape of irregular, dark green, sunken, rough patches of variable size over all parts of the fruit, the texture, colour, and flavour of which were impaired; browning of the tissues surrounding the stone; and breakdown of the same tissues.

Beran (F.). **Pflanzenschutzmittel. (Verzeichnis 1935.)** [Plant protectives. (List for 1935).]—*Neuheiten PflSch.*, xxviii, 2, pp. 37–46, 1935.

Particulars are given in tabular form of the origin, purposes, and mode of application of the insecticides, fungicides, stimulants and soil disinfectants, and other agricultural preparations officially recommended by the Austrian Federal Institute for Plant Protection (Vienna II, Trunnerstr. 1).

Borchers (F.) & May (E.). **Methoden zur Prüfung von Pflanzenschutzmitteln. VIII. Betrachtungen und Untersuchungen über die physikalischen Eigenschaften staubförmiger Pflanzenschutzmittel.** [Methods of testing plant protectives. VIII. Observations and investigations on the physical properties of plant protective dusts.] —*Mitt. biol. Anst.* (*Reichsanst.*) *Berl.*, 50, pp. 5–55, 8 diags., 3 graphs, 1935.

The authors discuss in some detail the methods in current use in Germany for the testing of plant protective dusts (mostly with reference to their value in the extermination of insect pests in the forest) [cf. *R.A.M.*, xii, p. 577] in respect of such matters as specific gravity, particle size and shape, suspensory properties in air and tendency to clumping, adhesiveness, facility of dispersion, and hygroscopicity.

BABEL (A.). **Beizmethoden.** [Steeping methods.]—*Nachr. Schädl-Bekämpf., Leverkusen,* x, 1, pp. 28–37, 12 figs., 1935.

Particulars of the purpose and application, together with illustrations, are given of the following apparatus now in current use in Germany for the disinfection of cereal and other seeds: Degesch (liquid), Lothrä, Primus, Puk, Globus, Klein-Tillator, and Neusaat-Grosstillator (dusting), and Primus, Miag, and Kontramix (short disinfection process), all of which have already been referred to from time to time in this *Review.*

HEGE (R.). **Încercări cu aparate de stropit.** [Trials of spraying apparatus.]—*Anal. Inst. Cerc. agron. Român.,* vi, pp. 353–401, 26 figs., 5 graphs, 1934. [German summary. Received June, 1935.]

After a brief exposition of the chief theoretical desiderata which should be fulfilled by spraying apparatus, the author gives an account of the results of official trials in Rumania in 1932–3 of thirteen sprayers of different types presented by one Rumanian and five foreign firms, the working of which is described in some detail. The advantages and disadvantages of each apparatus in relationship to local soil and cultural conditions are discussed in some detail.

DE ONG (E. R.). **The use of oil-soluble copper as a fungicide.**—*Phytopathology,* xxv, 3, pp. 368–370, 1935.

Determined by the colorimetric method described in *Bull. U.S. Dep. Agric.* 785, 1919, 80 per cent. of copper was recovered after thirty days from apricot leaves and twigs and plum twigs sprayed in the late autumn with a highly concentrated Bordeaux mixture, but none could be detected in the tissue by H. Martin's method of digesting the twigs after removal of the surface copper. The corresponding amount of copper recovered from the surface twigs treated with palustrex (copper resinate dissolved in a pine-tar oil) [*R.A.M.*, xii, p. 182] was 60 per cent.; within the tissue was a further 21 per cent. of the total amount applied, indicating that this substance penetrates the interior of leaves and twigs to such an extent as to be recoverable in demonstrable quantities. No doubt the uniformity of external and internal distribution, coupled with economy in the use of copper, largely accounts for the increasing popularity of this very efficacious fungicide in California.

HORSFALL (J. G.). **Pasteurizing soil electrically to control damping-off.**—*Bull. N.Y. St. Agric. Exp. Sta.* 651, 8 pp., 3 figs., 1935.

An account is given of tests carried out under commercial conditions in New York with an appliance designed to sterilize greenhouse soil electrically [*R.A.M.*, xiv, p. 460]. It consists of a container made of boiler plate insulated on the outside and holding 1 cu. yd. of soil; heat is furnished by electric elements covered with aluminium fins to disperse it into the soil. The consumption of current amounts to 5 kw. per hour at 220 volts, but the chief advantage of the machine is that the soil is heated in four hours or more, depending on its coldness or wetness, to a relatively low temperature (45° to 50° C.), after which the current is turned off and the heat in the soil allowed to act on it for twelve hours or more. Pasteurization by this means gave satisfactory control of

damping-off (due chiefly to *Pythium ultimum* [ibid., xiv, p. 382] and to a less extent to *Rhizoctonia* [*Corticium*] *solani* and *Botrytis* sp.) without injuring the soil.

LESZCZENKO (P.). **Wpływ nawożenia mineralnego na stan zdrowotności roślin uprawnych.** [The effect of mineral fertilization on the health of cultivated plants.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy* 14, pp. 51–78, 1935. [French summary.]

The author gives a fairly full review of the investigations carried out during the last ten or fifteen years on the effect of mineral fertilizers on the health and disease resistance of cultivated plants, with special reference to cereals, potatoes, beets, and other industrial crops [most of which have been noticed from time to time in this *Review*]. His chief aim in publishing this paper is to stimulate similar research in Poland, where but little, according to him, has been done so far on the problem of the possibility of controlling certain fungal diseases and insect pests by fertilizers. He considers that the results obtained by foreign workers show fair promise, even though some of them are not quite conclusive and require confirmation.

PITTMAN (H. A.). **Some serious plant diseases in Western Australia which are brought about by unusually high temperatures.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xii, 1, pp. 1–7, 4 figs., 1935.

After distinguishing between parasitic and non-parasitic plant diseases and listing some of the commonest of each kind found in Western Australia, the author discusses how the conditions that prevail during heat waves cause injury to plants and briefly describes a number of diseases due to such factors, including burning-back of vine, loquat [*Eriobotrya japonica*], and plane-tree leaves, 'wind-injury' of wheat heads (caused by the withdrawal of water from the ears by the excessive transpiration of the leaves), internal decline of lemons [*R.A.M.*, xii, p. 214], blossom-end rot of tomatoes [ibid., xii, p. 733], blotchy core of apples [ibid., ix, p. 322], and water-core and heat crinkle of apples [ibid., xi, p. 55] and Japanese plums [? *Prunus salicina*]. The paper concludes with brief directions for the mitigation of the effects of excessive heat by improved cultural practices.

GARDNER (H. A.), HART (L. P.), & SWARD (G. G.). **Mildew prevention.**—*Circ. Nat. Paint, Varn. Lacq. Ass., Inc., Sci. Sect.* 475, 13 pp., 1935. [Abs. in *Build. Sci. Abstr.*, viii (N.S.), 4, pp. 126–127, 1935.]

For white or pale-coloured paints on a white base zinc oxide is stated to be a very satisfactory pigment from the standpoint of mildew resistance [cf. *R.A.M.*, x, p. 525; xiv, p. 137], while mercuric chloride, phenyl mercuric acetate, or ammoniated mercury may be added to the finishing coats in ratios of about 1 : 500 to 1 : 900. Such additions have been found to render the coatings practically free from fungal invasion. Red cuprous oxide is similarly effective for red and brown coatings, while good results have also been given by spar varnish. Thymol is less efficacious for outdoor purposes, but is useful for the interiors, e.g., of bakeries, textile mills, or other buildings in which high temperatures may prevail and the employment of mercury compounds is undesirable.

JOHNSON (J.) & HOGGAN (ISMÉ A.). **A descriptive key for plant viruses.**—*Phytopathology*, xxv, 3, pp. 328–343, 1935.

Discussing the need for a more complete and systematic description of plant viruses, the writers recapitulate their previous arguments [*R.A.M.*, vi, p. 501; viii, p. 592] in favour of using as a basis the characters of the virus itself rather than the symptoms induced by its action (see also *Science*, N.S., lxxiii, p. 29, 1931). The following are believed to be the chief diagnostic features of a virus that are of value for descriptive purposes: (1) modes of transmission; (2) natural or differential hosts; (3) longevity *in vitro*; (4) thermal death point; and (5) certain distinctive or specific symptoms [cf. *R.A.M.*, x, p. 747; xi, p. 591; xiii, p. 719]. Transmission by sucking insects and the identity of the vector concerned, together with mechanical transmission by plant extracts and transmission by grafting, are considered to provide the main bases for differentiation. Utilizing chiefly these criteria, a descriptive key for plant viruses is given in tabular form, placing some fifty of the known viruses in several fairly well-defined groups bearing a certain natural relationship to one another, further intensive study of which may furnish a logical foundation for classification.

TAKAHASHI (W. N.) & RAWLINS (T. E.). **The relation of stream double refraction to Tobacco mosaic virus.**—*Science*, N.S., lxxxi, 2099, pp. 299–300, 1935.

The writers have previously shown that material causing stream double refraction (M.C.S.D.R.) occurs in higher concentration in mosaic than in healthy tomato juice [*R.A.M.*, xiv, p. 201]. Assuming that most of the S.D.R. produced by the juice of plants infected by tobacco mosaic is due to the virus particles of the latter, a positive correlation would be expected between the virus concentration and M.C.S.D.R. The experiments [which are briefly described] undertaken to gain information on this point gave somewhat inconclusive results, but the indications are that S.D.R. is a function of the particles.

SMITH (ELIZABETH C.). **Effects of ultra-violet radiation and temperature on Fusarium. II. Stimulation.**—*Bull. Torrey bot. Cl.*, lxii, 3, pp. 151–164, 4 graphs, 1935.

The results of further experiments with *Fusarium eumartii* [*R.A.M.*, xiv, p. 386] are considered to indicate that the stimulation of vegetative growth of the fungus which in some cases followed its exposure to ultra-violet radiation (but never except after an initial retardation), is merely an indirect effect of radiation and a direct effect of retardation. This view is supported by the facts that other factors which produce an initial retardation also result in stimulation, and that temperature and nutritional conditions favouring growth of the fungus also favour stimulation. It is suggested that factors promoting the formation and accumulation in the fungus of labile products also promote stimulation after retardation. On the other hand, there was an indication that ultra-violet radiation may have a direct rather than an indirect stimulative effect on spore production, the maximum production occurring after a 30-second exposure regardless of the rate of growth of the fungus.

WARD (G. E.), LOCKWOOD (L. B.), MAY (O. E.), & HERRICK (H. T.). **Production of fat from glucose by moulds. Cultivation of Penicillium javanicum van Beijma in large-scale laboratory apparatus.**—*Industr. Engng Chem.*, xxvii, 3, pp. 318–322, 1 diag., 1935.

A survey of sixty-one species of *Aspergillus* and *Penicillium* indicated that one of the former (*A. flavus*) and nine of the latter contained over 15 per cent. ether-soluble material (*P. piscarum* Westl. and *P. flavo-cinereum* Biourge 26 to 28 and 28·5 per cent., respectively) when grown with glucose. An intensive study of *P. javanicum* van Beyma [*R.A.M.*, xiii, p. 474] showed that its mycelium may contain up to 41·5 per cent. fat, depending on cultural conditions.

A cabinet for the experimental study of large-scale shallow-pan fermentations is described, following the basic design of the sterilizer-incubator described by Birkinshaw *et al.* (*Philos. Trans.*, B, ccxx, pp. 136, 366, 1931) and somewhat resembling that of Petersen *et al.* (*Industr. Engng Chem.*, xxv, p. 213, 1933), and representative results of culture trials conducted therewith are presented. Under such conditions, increase of the glucose content of the medium does not appear to involve a parallel augmentation in the fat content of the *P. javanicum* mycelium, as is the case in flask cultures. The free fatty acid content of the fat obtained from the mycelium grown on 30 and 40 per cent. glucose solutions is much higher than that of fat similarly derived from 20 per cent. glucose solutions. Besides fat, the mycelium of *P. javanicum* yielded a complex carbohydrate and a chitinous material.

PRILL (E. A.), WENCK (P. R.), & PETERSON (W. H.). **The chemistry of mould tissue. VI. Factors influencing the amount and nature of the fat produced by Aspergillus fischeri.**—*Bio-chem. J.*, xxix, 1, pp. 21–33, 1 graph, 1935.

Appreciable differences were noted in regard to the amount and nature of the mycelial fats produced by one stock and eight monospore cultures of *Aspergillus fischeri* [*R.A.M.*, xii, p. 529 and preceding abstract]. The production of mycelia with high fat contents was promoted by neutral or slightly alkaline media, a high initial concentration of cerelose (commercial glucose), and a low ammonium nitrate concentration. The production of increased amounts of ergosterol in the mycelium was favoured by a fairly high initial concentration of glucose, 1 per cent. ammonium nitrate or an initially acid medium containing an equivalent amount of urea, a higher temperature (37° C.), and a protracted incubation period. Augmented phospholipin production resulted from a low initial glucose content, 1 per cent. ammonium nitrate, and an initially slightly acid medium. During inanition the bulk of the fat was utilized by the fungus.

HENRARD (P.). **Polarité, hérédité et variation chez diverses espèces d'Aspergillus.** [Polarity, heredity, and variation in different species of *Aspergillus*.]—*Cellule*, xliii, 3, pp. 351–424, 6 pl., 1934.

A study [which is fully described] of polarity, heredity, and variation in nineteen different species of *Aspergillus* of the *A.* '*glaucus*' series, using monoascospore cultures, showed that all the germinating monospore cultures produced normal perithecia, thus demonstrating strict

sexual homothallism. *A. nidulans* was also sexually homothallic, though it is physiologically 'bipolar' or heterothallic; this character became apparent only when two strains of opposite polarity met, in which case they fell into two physiological classes, referred to as A and a. Bipolarity was shown at the line of junction in the formation of a red stripe underneath the cultures and in arrested growth on the surface; this arrest of growth was sometimes confined to the conidiophores, in other cultures it consisted in a true mycelial barrier, and occasionally it favoured the production of a very thick row of perithecia on either side of the line of junction. None of these phenomena occurred when the strains that met belonged to the same physiological class. A variant (*A. nidulans imminutus*) [which is described] appeared on several occasions in certain monoascospore cultures of *A. nidulans*; it was apparently stable, but there was insufficient evidence to establish it definitely as a mutant since it did not form ripe ascospores and it is not known whether its distinctive characters are transmissible by the ascospores. A second variant (*A. nidulans fertilior*) [which is also described] occurred once, as a result of mutation, and remained stable through both conidial and ascosporal generation. In both forms the physiological bipolarity of the parent strains survived variation and mutation.

PUNKARI (LAILA) & HENRICI (A. T.). **Further studies on spontaneous variations of Torula pulcherrima.**—*J. Bact.*, xxix, 3, pp. 259–267, 3 diags., 1935.

Variations in the chromogenic, asporogenous yeast, *Torula pulcherrima*, have been studied through six further generations [*R.A.M.*, xiii, p. 47]. Among the new variants are colonies with red soluble pigment, and white ones with craters which are regarded as a form of 'roughness'. The white variants have shown much greater stability than the red parent type. The former generally arise from red in the actively growing peripheral cells of the colony, whereas the red develop from white in the older central portions.

KOCH (K.) & JOHNSON (J.). **A comparison of certain foreign and American Potato viruses.**—*Ann. appl. Biol.*, xxii, 1, pp. 37–54, 3 pl., 1935.

A brief account is given of the authors' comparative studies of the viruses obtained from apparently healthy and virus-diseased potato tubers sent from Australia (eight varieties), Brazil (six varieties), Bulgaria (sixteen varieties), England (four varieties), Germany (four varieties), Holland (six varieties), Irish Free State (four varieties), Japan (two varieties), and the U.S.S.R. (twenty-five varieties). The experimental procedure consisted in inoculating Bliss Triumph potatoes free from the ordinary virus diseases but carrying the 'mottle' virus and often the potato 'ring spot' virus, and tobacco plants (Connecticut Havana No. 38) with extracted juice from plants raised from the imported tubers. If infection resulted on either host, the virus or viruses thus isolated were compared, as far as possible, with other related forms of American occurrence. Viruses not transmissible mechanically by plant extracts were not considered.

The results showed that the potato 'mottle' virus [*R.A.M.*, xii, p. 588], which has been shown to occur regularly in all tubers of most,

if not all, standard American varieties, was present in one or more varieties from each of the nine foreign countries mentioned above, the proportion being lowest (1 in 5) from Brazil and highest (6 in 8) from Australia. Inoculations into tobacco failed to give any evidence suggesting that the 'mottle' virus secured from the various sources was different from the American. The potato 'ring spot' virus as known in America [loc. cit.] was found in association with practically all cases of mottle [ibid., xiv, pp. 385, 388] in foreign potatoes, except in the Bulgarian ones. A few cases of questionable ring spot were noted in potatoes from Holland, Ireland, and Russia, suggesting that the symptoms may vary within a wider range than recognized in America, or else that the cases in question were caused by still another, as yet undetermined, virus.

The veinbanding virus [ibid., xiii, p. 463; xiv, p. 385] was found in an apparently 'pure' state in potatoes from Holland, Germany, Bulgaria, Australia, and England (potato Y virus) [ibid., xiv, p. 246], and from Brazil only in combination with leaf roll; material from Ireland, Japan, and Russia failed to yield this virus, though it undoubtedly occurs in these countries. Comparative studies on the veinbanding virus from Bulgaria, Brazil, Germany, and the United States, and the Y virus from England, showed that the thermal death point, longevity *in vitro*, and tolerance to dilution of all these forms are essentially the same, and that all the forms from the different sources cause identical symptoms on tobacco and potato, with the exception of the English Y virus which failed, when inoculated into Bliss Triumph potato, to produce the typical symptoms of American rugose mosaic, although it yielded typical spot necrosis on tobacco. This, taken in conjunction with the fact that *Solanum nigrum* was apparently immune from the Y virus but susceptible to the veinbanding virus, and that slight differential symptoms appear on tobacco when the two viruses are combined with either the mottle or the ring spot virus, leads the authors to conclude that Smith's Y virus is not identical with the American veinbanding virus, which appears to be the more common and universally distributed of the two forms.

Typical crinkle mosaic virus [ibid., xii, p. 48] was secured from Australia and Japan, and also found in potatoes from Ireland reported as affected with crinkle, and in potatoes from England reported as containing 'crinkle A' [ibid., xiii, p. 257]. While admitting that the problem of the association of the conditions described as potato streak and leaf drop with any particular viruses still remains obscure, a tentative description is given of a 'potato streak virus' which was found in President potatoes from Ireland, and which is apparently not transmissible by *Myzus persicae* or *Macrosiphum solanifolii* [*M. gei*] but is transmissible mechanically. Its resistance to ageing *in vitro* is from four to six days at about 22° C., and its thermal death point is between 55° and 58° (10 min.). Primary infection causes distinct necrotic, streak-like symptoms on leaf veins, laminae, and stems of potato (Bliss Triumph and Green Mountain), generally resulting in the death of the bud, followed by a downward necrosis which may kill the whole plant. On tobacco it causes an indefinite and mild necrosis in the form of irregular blotches. The host range and distribution of this virus are not known.

Baribeau (B.). **The tuber-unit seed plot in Quebec.**—*Amer. Potato J.*, xii, 3, pp. 62–64, 1935.

The following record of a potato tuber-unit seed plot at Ste. Anne de la Pocatière, Quebec, is considered clearly to demonstrate the value of this method of combating virus diseases [*R.A.M.*, xii, p. 50]. In 1928 a tuber-unit plot measuring approximately $\frac{1}{10}$ acre was started with Green Mountain seed from the 1927 commercial crop, a high percentage of virus-infected plants being removed; the following year the commercial field was planted with selected seed for the first time. Thenceforward the yields in the commercial field planted from the plot steadily rose from 369·1 bushels per acre in 1929 to 417 in 1934, as against 287·7 in 1928.

Stapp (C.). **Beitrag zur Frage der Widerstandsfähigkeit verschiedener Kartoffelsorten gegen Schwarzbeinigkeit und Knollennassfäule, verursacht durch Bacillus phytophthorus App.** [A contribution to the question of the resistance of different Potato varieties to blackleg and tuber wet rot caused by *Bacillus phytophthorus* App.]—*Angew. Bot.*, xvii, 2, pp. 97–117, 1935.

The results [which are tabulated and discussed] of six years' field experiments (1928 to 1934) at Berlin-Dahlem on the reaction of thirty potato varieties to seed-tuber inoculation by injection of the flesh with a suspension of two very virulent strains of *Bacillus phytophthorus* [*R.A.M.*, viii, p. 396] showed two to be highly resistant, viz., Alte Daber and Flava, five (including Beseler and Konsum) slightly susceptible, nine (including Goldappel, Arnica, Deodara, Dir. Johanssen, Cellini, and Glückauf) very susceptible, and eight (including Juli, Preussen, and Erdgold) excessively so. There was some evidence, not altogether conclusive, of a correlation of late maturity and white flesh colour with resistance, but no definite connexion could be traced between the latter character and skin thickness (except indirectly, since the organism is a wound parasite or reaches the tuber through the stolon), capacity for wound periderm formation, or rapidity of decay [ibid., xiii, p. 391].

Ledingham (G. A.). **Occurrence of zoosporangia in Spongospora subterranea, Wallroth (Lagerheim).**—*Nature, Lond.*, cxxxv, 3410, p. 394, 4 figs., 1935.

At the National Research Laboratories, Ottawa, Canada, tomato and potato seedlings were planted in soil inoculated, after steam sterilization, with spore balls of *Spongospora subterranea* from diseased potato tubers. Heavy infection developed in the root hairs of both hosts in a fortnight at 65° F. All stages in the evolution of the organism were observed from amoebae that had just penetrated the host to mature zoosporangia, the latter sometimes occurring singly in the root hairs or epidermal root cells but more often lying in rows or clusters of up to a dozen or more, nearly filling the host cell. The formation of clusters instead of a single zoosporangium appears to be effected by a budding process. Zoospore discharge is accomplished through a rupture in the host cell wall induced by pressure from a swelling developing at a certain point in the zoosporangium. The zoospores from zoosporangia (not

hitherto described in the life-history of *S. subterranea*) resemble those from germinating spore balls in size, shape, ciliation (two cilia of unequal length), and manner of swimming [*R.A.M.*, xiii, p. 599]. A possible fusion of gametes is suggested by the presence of occasional binucleate spores with four cilia.

SZYMAŃSKI (W.). **Studja biochemiczne nad porażeniem Ziemniaków grzybkiem raka ziemniaczanego, Synchytrium endobioticum (Schilb.) Perc. II. Różnice koncentracji jonów wodorowych oraz ilości kwasów w soku kiełków zdrowych i porażonych.** [Biochemical studies on the infection of Potatoes with the Potato wart fungus, *Synchytrium endobioticum* (Schilb.) Perc. II. Differences in the concentration of hydrogen-ions and in the quantity of acids in the sap of healthy and infected germinating sprouts.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy* 14, pp. 107–123, 3 graphs, 1935. [French summary.]

Continuing his biochemical studies on the potato wart disease (*Synchytrium endobioticum*) [*R.A.M.*, xii, p. 718] the author describes experiments with Early Rose potatoes, the results of which showed that, as determined directly in sprouting tubers, the hydrogen-ion concentration was highest (P_H 5·215) in healthy sprouts, lower (5·46) in warted sprouts, and lowest (6·22) inside the tubers. The same relationship was also shown to hold for the sap extracted from the different organs, although the acidity of the expressed juices rapidly declined on standing in every case. The P_H value of the sap of infected sprouts is nearer to that of wart outgrowths than to the P_H value of the sap in healthy sprouts.

GARBOWSKI (L.) & LESZCZENKO (P.). **Sprawdzanie odporności Ziemniaków na raka Ziemniaczanego, Synchytrium endobioticum (Schilb.) Perc.** [Trials of Potatoes for resistance to Potato wart disease, *Synchytrium endobioticum* (Schilb.) Perc.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy* 14, pp. 5–28, 1 pl., 1935. [French summary.]

Of the 180 [listed] varieties of potatoes of various origin that were tested in 1932 and 1933 in Poland for resistance to wart disease (*Synchytrium endobioticum*) in the laboratory and in the field [*R.A.M.*, xi, p. 743], the highest resistance, amounting to entire immunity, was shown by certain varieties from Scotland, namely, Ally, Arran Banner, Arran Crest, Great Scot, Golden Wonder, and Majestic; Incomer was only infected in the laboratory, and should be tested further, while Kerr's Pink showed initial stages of infection, but did not develop either warts or winter sporangia. High resistance was also exhibited by the Polish varieties Marszalek, Palatyn, Direktor Johanssen, and Beta; the German varieties Beseler, Maibutter, Parnassia, Paul Wagner, Roon, Albabona, Berlichingen, Berolina, Hellena, Jubel, Juli, Pepo, Rosafolia, and Wekaragis; and the Dutch variety Robijn. All the other varieties were more or less susceptible.

SMALL (T.). **Prevention of blight (Phytophthora infestans) in seed Potatoes.**—*Ann. appl. Biol.*, xxii, 1, pp. 16–22, 1935.

Brief details are given of experiments in Jersey in 1932, the results

of which showed that regular and thorough spraying of potato haulms was very effective in controlling tuber rot caused by late blight (*Phytophthora infestans*) at harvest time, but not the rot developing in storage, especially in seed tubers. Removal from the field or scorching of the haulms *in situ* with an acid spray (e.g. 12 lb. copper sulphate and ¼ lb. caustic soda in 40 galls. water) three days prior to digging gave good control of the storage rot of seed tubers, as did also dipping the tubers in a fungicide immediately after digging [*R.A.M.*, xiii, p. 591].

Rieger (H.). **Phytophthora-Vorbeuge und Bekämpfung.** [*Phytophthora* prevention and control.]—*Dtsch. landw. Pr.*, lxii, 11, p. 135, 2 figs., 1935.

Strikingly good results are stated to have been obtained in the control of potato blight (*Phytophthora infestans*) on moorland soils in Upper Bavaria during the last two years by two applications (beginning and middle of July) of Wacker's Bordeaux mixture (Drawingesellschaft, Prinzregentenstr. 20, Munich) [*R.A.M.*, xiv, p. 79], the first at a strength of 1·5 and the second at 1 per cent. The varieties treated were all early ones, namely, Erstling [Duke of York], Early Rose, Kaiserkrone, Odenwälder Blaue, and Böhms Allerfrüheste Gelbe, the yields of which were increased by as much as 125 doppelzentner per hect. The cost of one treatment was estimated at M. 5 per hect.—an area that can be covered in one day by a man with a knapsack apparatus.

Leszczenko (P.). **Rhizoctonia solani K. (Hypochnus solani P. et D.) na Ziemniakach.** [*Rhizoctonia solani* K. (*Hypochnus solani* P. & D.) on Potatoes.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy* 14, pp. 29–49, 1 pl., 1935. [English summary.]

The author states that during the last few years potatoes in Poland have suffered increasingly from attacks by *Rhizoctonia* [*Corticium*] *solani* both on the tubers and on the stems, presumably owing to weather conditions. In pot experiments with pure cultures of the fungus he established that it is in a large measure responsible for the rot of germinating potato sprouts which has been repeatedly observed in the country, and that soil moisture greatly favours this trouble. Applications of superphosphate and basic slag did not appear to affect the incidence of the rot. Good control of the disease in the field was obtained by dipping seed tubers for 1½ hours in a 0·1 per cent. mercuric chloride or a 0·125 per cent. uspulun solution [cf. *R.A.M.*, xiv, p. 118], but less satisfactory results were given by 30 minutes' immersion in 0·5 per cent. formaldehyde solution or by dusting the tubers with abavit B. Observations on the field behaviour of a large number of potato varieties to the disease during the period from 1930 to 1932, inclusive, are summarized in a table.

Van der Slikke (C. M.). **Verslag van Rijkstuinbouwproefvelden over grondontsmetting tegen de Rhizoctoniaziekte en de schurft op Aardappelen.** [Report of the State horticultural field-plot tests on soil disinfection against *Rhizoctonia* disease and scab of Potatoes.] —*Tijdschr. PlZiekt.*, xli, 3, pp. 65–73, 1935.

The treatment of planting holes with ¼ l. of 0·05 per cent. mercuric

chloride or with $\frac{1}{8}$ l. of a 0·1 per cent. solution was found to be very effective against the *Rhizoctonia* disease of potatoes [*Corticium solani*] in Holland [cf. *R.A.M.*, viii, p. 806, and preceding abstract]. The temporary depression in the early period of growth resulting from the treatment had no permanent effect, except in the case of early lifting of early varieties. Good results were also obtained by this method (using $\frac{1}{4}$ l. of a 0·1 per cent. solution) in scab [*Actinomyces scabies*] control. The treatment can necessarily be only partially effective in such varieties as Eigenheimer, in which the tubers develop at a considerable distance from the plant hole.

LAURITZEN (J. I.). **Factors affecting infection and decay of Sweet Potatoes by certain storage rot fungi.**—*J. agric. Res.*, l, 4, pp. 285–329, 2 graphs, 1935.

The results of experiments at Washington, D.C., and the Arlington Experiment Farm, Virginia, showed that the nature of the fungal rots that develop in sweet potatoes during storage [*R.A.M.*, xiv, p. 118] largely depends on the local occurrence of the causal organisms. *Rhizopus nigricans*, *R. tritici*, *Fusarium oxysporum*, and species of this last genus causing end rot are the most generally distributed, while *Diplodia tubericola* and *Sclerotium bataticola* [*Macrophomina phaseoli*] are less widespread and more restricted to the southern part of the sweet potato-growing belt. More or less extensive wounding appears to be an essential condition for the primary infection of sweet potatoes by any of these fungi, the further progress of which is favoured by storage conditions of temperature and humidity tending to prevent or greatly retard the formation in the roots of a wound periderm layer which acts as an effective barrier against infection and retards shrivelling of the roots.

The rest of the paper is given to a detailed account of experiments, the results of which were summarized in a recent publication on the prevention of storage rots in sweet potatoes [loc. cit.].

HIROE (I.). **Experimental studies on the saltation in fungi (preliminary report) IX. On the biological characters of pseudo-myceliolyse.**——*Ann. phytopath. Soc. Japan*, iv, 3–4, pp. 178–190, 8 figs., 1935. [Japanese, with English summary.]

The writer has investigated the biology of the phenomenon of pseudo-myceliolysis [*R.A.M.*, xii, p. 584] in the rice leaf spot fungus *Ophiobolus miyabeanus* [see next abstract]. The optimum temperature for the process on potato sucrose-agar was found to range from 23° to 28° C., with particularly clear-cut results at 24°, the minimum and maximum being just above 16° and below 37°, respectively. Other favourable media for the observation of pseudo-myceliolysis were rice straw decoction, synthetic media with asparagin and peptone, maize meal, and apricot decoction; on onion and soy agar the phenomenon did not occur. The inception of pseudo-myceliolysis was detected in 54 to 74 (average 64) hours after inoculation at 32° and 49 to 69 (average 59) hours at 23°; the entire process occupied a period of some 20 hours.

TULLIS (E. C.). **Histological studies of Rice leaves infected with Helminthosporium oryzae.**—*J. agric. Res.*, l, 1, pp. 81–90, 6 figs., 1935.

The histological studies briefly reported in this paper showed that *Helminthosporium oryzae* (the conidial stage of *Ophiobolus miyabeanus*) [*R.A.M.*, xiv, p. 468] may enter rice leaves through a stoma or may penetrate directly into the cells of the epidermis, invasion appearing to occur most frequently in the motor cells which are often almost entirely filled with the mycelium of the fungus. The mycelium then passes into the intercellular spaces of the photosynthetic area of the leaf, and in the more susceptible varieties this invasion progresses rapidly, until the leaf spots frequently extend from the midrib to the margin. The deeper hyphae frequently arise from a subepidermal mycelium that extends through the substomatal spaces along the leaf. The fibro-vascular bundles tend to form barriers against the lateral spread of the fungus, and penetration of the bundle sheath cells is necessary to permit of invasion of adjacent new areas; this apparently is accomplished much more easily in some varieties than in others, and does not occur at all in very resistant ones. In resistant varieties the progress of the fungus is also impeded by the formation in the tissues of yellowish-brown deposits which accumulate in the intercellular spaces in advance of the invading hyphae, and the chemical nature of which has not been determined.

FAWCETT (G. L.). **Una nueva enfermedad del Arroz en Tucumán: la brusone (Piricularia oryzae).** [A new Rice disease in Tucumán: blast (*Piricularia oryzae*).]—*Circ. Estác. exp. agríc. Tucumán* 42, 6 pp., 1 fig., 1935.

Attention is drawn to the recent detection for the first time in Tucumán, Argentine Republic, of rice blast (*Piricularia oryzae*) [*R.A.M.*, xiii, p. 725], so far in a relatively mild form and affecting chiefly the late-sown dry-land varieties, though a very low incidence of infection (1 per cent. or less) was also observed in Blue Rose crops under irrigation; Fortune appeared to be practically immune. The disease is stated to be most prevalent in plantations belonging to rice mills and the like, for which seed imported from Brazil during the last two years has been used. In view of the formidable character of rice blast in other countries, no effort should be spared to prevent its further spread in the Argentine. An important control measure, in addition to the usual sanitary practices, consists in the exclusion from rice fields, so far as possible, of fodder grasses, of which *Panicum sanguinale*, at any rate, is susceptible to blast. It is recommended to grow crops such as maize, lucerne, &c., in infected fields for one or two years before again growing rice.

LEPIK (E.). **Über die Krankheiten der Arzneipflanzen in Estland.** [On the diseases of drug plants in Esthonia.]—*Mitt. phytopath. Vers Sta. Tartu* [*Dorpat*] 24, 8 pp., 1935. [German summary.]

A briefly annotated list is given of the more serious fungal diseases which were observed in 1934 on drug plants grown in the neighbourhood of Tartu [Dorpat], including *Cercospora traversiana* (recorded for the

first time in Esthonia) on *Trigonella foenum-graecum* [*R.A.M.*, xiv, p. 286], *Erysiphe artemisiae* on *Artemisia vulgaris* (but not on adjacent *A. absinthium*), *E. valerianae* on *Valeriana officinalis*, and *Macrosporium saponariae* on *Saponaria officinalis*. Considerable damage to peppermint (*Mentha piperita*) during the summer was caused by *Puccinia menthae* [ibid., xiii, p. 668], which was also found on *M. arvensis*, *Calamintha acinos*, *Clinopodium vulgare* [*Calamintha clinopodium* Benth.], and *Satureia hortensis*. Since 1925 certain cultivated species of *Iris* have been increasingly attacked by rust (*Puccinia iridis*); the fact, however, that infection was restricted to certain species and the indigenous *I. pseudacorus*, *I. germanica*, and *I. sibirica* remained immune is considered to indicate that this rust is physiologically different from the form which is occasionally found on the native species [cf. ibid., xiii, p. 380].

MARTIN (J. P.) & CARPENTER (C. W.). **Sugar Cane pathology.**—*Proc. Hawaii. Sug. Pl. Ass., 1934*, pp. 113–124, 1935.

In this paper the authors list the sugar-cane diseases until now excluded from Hawaii by the quarantine regulations in force in the Territory, and give brief notes on the causes and control of those actually present, viz. brown stripe (*Helminthosporium stenospilum*) [*R.A.M.*, xiii, p. 655], chlorotic streak [fourth disease: ibid., xiii, pp. 654, 686], eye spot (*H. sacchari*) [ibid., xiii, p. 12], leaf scald (*Bacterium albilineans*) [ibid., xiii, p. 472], mosaic [ibid., xiii, p. 471], and root rot (*Pythium graminicolum*, formerly referred to as *P. aphanidermatum*) [ibid., xii, p. 723].

LYON (H. L.). **Botany, forestry and pathology.**—*Rep. Hawaii. Sug. Exp. Sta. 1934* (*ex Proc. Hawaii. Sug. Pl. Ass., 1934*), pp. 27–37, 1935.

This report contains, among others, the following items of phytopathological interest. Experiments by J. P. Martin failed to demonstrate the cause and manner of transmission (otherwise than by cuttings) of sugar-cane chlorotic streak [see preceding abstract]; further investigations are in progress. Suspect planting material should be submitted to the hot water treatment (52° C. for 20 minutes).

When sugar-cane was grown in water cultures deficient in elements essential to growth, *Pythium graminicolum* [loc. cit.] became a seriously injurious factor, particularly when any of the following elements were lacking: iron, phosphorus, sulphur, manganese, potassium, magnesium, or calcium, most injury occurring in the minus-calcium series. In the minus-nitrogen series, on the other hand, root growth was stimulated and no infection took place. Studies by C. W. Carpenter showed that nitrogen in excess for any particular variety conduces to susceptibility to *P. graminicolum* both in virgin soil and in soils where the disease is not usually present. Deficiency of available phosphate promoted infection and growth failure in varieties not markedly susceptible to the effects of excess nitrogen, though P.O.J. 2878 tolerated a high nitrogen and a low phosphate content and maintained considerable resistance to infection. Abundant soil moisture and a soil temperature of 70° F. or under favoured attack.

J. P. Martin found that leaf scald [*Bacterium albilineans*: loc. cit.] was not satisfactorily controlled by the hot water treatment. Under field conditions the disease is transmitted mainly in cuttings and on the knives. Observations over a period of years showed that it is much more serious on the leeward than on the windward side of Hawaii and the neighbouring islands, and that it is particularly prevalent in areas of high temperature and low rainfall. Definite symptoms of Pahala blight [*R.A.M.*, xii, p. 788] were induced by growing the canes in nutrient solutions lacking manganese, normal growth being resumed when manganese was added.

Report on the British West Indies Central Sugar Cane Breeding Station for the year ending September 30th, 1934.—20 pp., [? 1935.]

Among the items of phytopathological interest in this report may be mentioned the investigations of the Assistant Botanist (G. C. Stevenson) on gumming disease of sugar-cane (*Bacterium vascularum*) [*R.A.M.*, xiii, p. 803]. From six months' observations in Barbados on twenty varieties of widely differing reaction to the disease, interplanted with the very susceptible Ba. 11569, it is evident that, in general, a high degree of susceptibility to leaf symptoms is correlated with extensive systemic infection. For practical purposes, therefore, varieties showing few or no leaf symptoms may be regarded as resistant to gumming disease, while it is at least probable that more serious forms of infection will develop in those contracting severe foliar injuries.

The reaction of over 300 varieties to *Bact. vascularum* has now been established by routine weekly observations in special trial plots, and from the available data the inheritance of resistance to the disease may be studied by calculating resistance fractions for populations from given parentages. Crosses giving a high percentage of susceptible seedlings, e.g., Ba. 11569 × Ba. 6032, are eliminated from the breeding programme.

Matsumoto (T.) & Yamamoto (W.). **Supplementary note on the helminthosporiose of Sugar Cane.**—Appendix to *Contr. phytopath. Lab. Taihoku Univ.* 27, 3 pp., 1 fig., 1935.

As a rectification of their identification of *Helminthosporium ocellum* as the agent of an eye spot disease of sugar-cane leaves in Formosa, Japan [*R.A.M.*, xiv, p. 396], the writers state that further observations on affected material indicate a closer approximation of the disorder to the brown stripe disease caused by *H. stenospilum*.

Fawcett (G. L.). **La fumagina de la Caña de Azucar de Santa Fé y Corrientes.** [Sooty mould of Sugar-Cane in Santa Fé and Corrientes.] —*Rev. industr. agríc. Tucumán*, xxiv, 7–8, pp. 165–167, 1 fig., 1934. [Received June, 1935.]

In June, 1933, and again in May, 1934, specimens of sugar-cane leaves covered by a sooty mould produced by a *Capnodium* or *Meliola* [cf. *R.A.M.*, x, p. 492] were received for examination at the Tucumán Experiment Station, in the former year from Santa Fé and in the latter from Corrientes. Fructifications sufficient to determine the causal fungus were not found. According to one report, no diminution of yield

has so far resulted from the trouble, but this, if actually the case, must be due to its tardy appearance, since the fungus grows in the sugary secretion of some injurious insect (probably Homoptera) and is capable of causing some damage by impeding photosynthesis. The common Argentine sugar-cane sooty mould, *Fumago sacchari*, on the other hand, is stated to be harmless to the plants since it appears to live on the waxy coating of the lower leaves. Studies are in progress to determine the identity of the insect primarily responsible for the newly observed trouble.

Bell (A. F.). **Sick soils.**—*Proc. Qd Soc. Sug. Cane Technol.*, vi, pp. 9–18, 1935. [Abs. in *Facts ab. Sug.*, xxx, 6, p. 226, 1935.]

'Soil sickness', a condition commonly observed where sugar-cane is grown continuously on the same land for many years, may be partially due to the exhaustion of certain elements of soil fertility but also results from the accumulation in the soil of root disease-producing organisms [cf. *R.A.M.*, vii, p. 600]. These may be killed by soil sterilization, following which the cane resumes normal growth, as was proved by the writer's laboratory and field experiments with a particularly susceptible variety, Q. 813, in Woongarra red volcanic soil. With P.O.J. 2878, which is resistant to root rot, the effect of soil sterilization, though not negligible, was much less pronounced than with Q. 813. Since this means of control is obviously impracticable on a large scale in the open field, the problem of sick soils centres round the cultivation of varieties with vigorous root systems, supplemented by the stimulation of root production by the adoption of a complete fertilizer programme.

Sawada (K.). **Materials of the Formosan fungi (30–34).**—*Trans. nat. Hist. Soc. Formosa*, xxiv, 131, pp. 123–129; 134, pp. 298–307; 135, pp. 450–460, 1934; xxv, 136–139, pp. 42–52; 140, pp. 132–139, 1935.

Continuing his studies on Formosan fungi [*R.A.M.*, xiii, p. 398], the writer gives an annotated list (in Japanese except for fungus and host names and bibliographical references) of twenty-two species, of which the following may be mentioned: *Ganoderma lucidum* [*R.A.M.*, xiii, p. 682] on *Acacia confusa*, *Albizzia lebbek*, and *Delonix regia* (Boj.) Raf. [*Poinciana regia* Boj. ex Hook.]; *G. applanatum* on *Acacia confusa*, *Albizzia lebbek*, *Melia azedarach*, mango, *Citrus maxima*, *C. sinensis* var. *brasiliensis* Tanaka, *C. unshiu*, *Bambusa stenostachya*, and *Prunus mume*; *G. rugosum* (*Polyporus rugosus*) on *Acacia confusa*; *Fomes ulmarius* [ibid., xi, p. 616] on *Liquidambar formosana*; *F. noxius* [ibid., xiii, p. 726] on *Bauhinia* sp.; and *Exobasidium camelliae-oleiferae* Sawada n.sp. [with diagnosis in Japanese only] on *Camellia oleifera*.

Stevens (F. L.) & Roldan (E. F.). **Philippine Meliolineae.**—*Philipp. J. Sci.*, lvi, 1, pp. 47–80, 3 figs., 1935.

An annotated list is given of seventy-three Meliolineae collected by the senior author in the Philippines in 1930–1 [cf. *R.A.M.*, vii, p. 743], including thirty-three new species with technical diagnoses in English, three new varieties, and one new combination.

Hiratsuka (N.). **Uredinales collected in Korea I.**—*Bot. Mag., Tokyo*, xlix, 579, pp. 145–152, 1935.

An annotated list is given of sixty-seven Uredinales collected in Korea mostly during 1934 (a few in 1933), of which the following may be mentioned: *Gymnosporangium clavariaeforme* [*R.A.M.*, ix, p. 754] on *Juniperus rigida*; *G. haraeanum* [ibid., xiii, p. 656] and *G. yamadae* [ibid., xii, p. 396] on *J. chinensis*, the former also on *Pyrus sinensis* Lindl. var. *culta* Mak.; *Phakopsora pachyrhizi* on *Glycine max*; and *Cronartium quercuum* [loc. cit.] on *Quercus mongolica*.

Edson (H. A.). **United States of America: Tobacco diseases for 1934 in the Atlantic Coast region.**—*Int. Bull. Pl. Prot.*, ix, 3, pp. 54–55, 1935.

Notes are given on the prevalence of some well-known fungous and bacterial diseases affecting the tobacco crops in the Atlantic Coast region of the United States during 1934.

Thung (T. H.). **Phytopathologische waarnemingen.** [Phytopathological observations.]—*ex* Jaarverslag 1 Mei 1933–30 April 1934.—*Meded. Proefst. vorstenl. Tab.* 81, pp. 25–37, 1935.

Heavy damage was caused in one tobacco plantation during the period under review by a disease hitherto observed only in a sporadic form in the Vorstenland, namely, the so-called 'pox' [*R.A.M.*, viii, p. 204], which has been found to be of virus origin and readily transmissible by the aphid *Myzus persicae*.

The weeding-out from the tobacco beds of *Synedrella nodiflora*, *Ageratum conyzoides*, and *Vernonia cinerea* [the alternate hosts of the Aleyrodidae transmitting 'kroepoek' or leaf curl: ibid., xiv, p. 335] should be started at least a month before planting out and repeated several times to check the new growth and thus ensure the efficacy of the operation.

The 'lanas' disease (*Phytophthora*) [*parasitica nicotianae*: ibid., xiii, p. 806] was almost equally well controlled by two applications of ordinary Bordeaux mixture or bouisol [ibid., xiv, p. 213], the incidence of infection in the seed-beds being reduced from 24·50 to 8·51 and 10·60 per cent., respectively. Promising results were also given in the control of this disease by soil disinfection with large quantities of terbolan, the commercial use of which, however, cannot be recommended as long as the present constant sources of external infection exist.

Extensive observations were made on mildew [*Erysiphe cichoracearum*: ibid., xiii, p. 806] in one plantation. Appreciable infection did not occur until the plants were fully grown, the first symptoms being observed along trenches and other low-lying, damp, shady areas, where the moisture between the plants very probably favours the growth of the fungus. The incidence of infection was found to increase with the age of the plants, so that early harvesting, which precludes the further spread of the fungus, is advantageous. *E. cichoracearum* attacks the broad-leaved varieties, such as E3K and EK, more severely than those of less luxuriant growth, e.g., Kanari and Y10.

HOGGAN (ISMÉ A.). **Two viruses of the Cucumber mosaic group on Tobacco.**—*Ann. appl. Biol.*, xxii, 1, pp. 27–36, 1 pl., 1935.

A brief description is given of a yellow cucumber mosaic virus which in 1928 and 1933 developed apparently spontaneously in tobacco plants that had been inoculated by aphids with ordinary cucumber mosaic [cf. *R.A.M.*, xiv, p. 5] in the greenhouse in Wisconsin. It was readily distinguishable from the latter by the conspicuous bright yellow mottling it produced on cucumbers, tomatoes, pokeweed (*Phytolacca decandra*), spinach, nightshade [*Solanum nigrum*], and eggplant, on which plants it also caused a more severe necrosis of the foliage and a slightly more marked stunting of the whole plant but somewhat less malformation than ordinary cucumber mosaic virus. The fact, however, that it appeared to be identical in modes of transmission, properties, and host range with the latter leads the author to regard it as a strain variant of this form.

A description is also given of a cucumber mosaic virus which was obtained in the autumn of 1933 by J. C. Walker from cucumbers growing in a commercial greenhouse in Milwaukee, Wisconsin, and which when inoculated into tobacco and other common hosts produced a milder type of symptoms than the ordinary cucumber mosaic, and also differed from the latter in its somewhat lower thermal death point and its lesser tolerance to dilution and longevity *in vitro*. In spite of these differences this virus, which is termed 'cucumber mild mosaic virus', is considered also to belong to the same general group of cucumber mosaics.

SALZMANN-DANIN (Mme Z.) & DE BONIS (E.). **Sulla deficienza di clorofilla in alcuni Tabacchi ed in particolare nel Burley.** [On the lack of chlorophyll in certain Tobacco varieties, especially Burley.]—*Boll. tec. Tab.*, xxxii, 1, pp. 18–35, 8 figs., 1935. [French summary.]

The leaves of certain tobacco varieties, e.g., White Burley and various strains derived from it at the Scafati (Salerno) Experiment Station, Sarì di Fersala and Sarì di Tessalia (Greek) and their hybrids (*Nicotiana tabacum*), and Chwitzent (*N. rustica*), have been observed gradually to lose their green coloration with approaching maturity and eventually to turn practically white. Histological studies revealed no anatomical abnormality but the cell content was reduced to a minimum and the chloroplasts had almost entirely disappeared. No improvement was effected by the application to the plants of iron or magnesium solutions [cf. *R.A.M.*, x, pp. 276, 686, 761], so that the form of albinism under observation cannot be ascribed to failure to absorb these elements. There was, however, an excess of potassium over calcium and magnesium in the affected foliage which is evidently correlated in some way, not yet fully elucidated, with the bleaching phenomenon.

BORTNER (C. E.). **Toxicity of manganese to Turkish Tobacco in acid Kentucky soils.**—*Soil Sci.*, xxxix, 1, pp. 15–33, 5 pl., 1935.

In connexion with a study of frenching of Turkish tobacco in unlimed Kentucky soils [*R.A.M.*, xiii, p. 731] a chlorotic condition was observed which was experimentally proved to be due to an excess of soluble manganese in the soil. The disorder was induced in plants in

water cultures by the addition to the nutrient solution of manganese at the rate of 15 p.p.m., and an analysis of plants grown in the affected areas revealed a general correlation between the extent of injury, percentage of manganese in the plants, and amount of this element leached from the macerated stems and leaves ground with distilled water.

CALDWELL (J.). **The physiology of virus diseases in plants. VII. Experiments on the purification of the virus of yellow mosaic of Tomato.**—*Ann. appl. Biol.*, xxii, 1, pp. 68–85, 2 pl., 1935.

Continuing his investigations on the nature of the virus of the yellow mosaic of tomato [*R.A.M.*, xiii, p. 660], the author gives details of experiments on the purification of this virus, using a slight modification of Vinson's and Petre's method [ibid., x, p. 761]. The results indicated that viruliferous material always contained traces of organic nitrogen, and no evidence was obtained that the virus could be recovered in a crystalline form [cf. ibid., xiii, p. 475]. The virus was found to be active over a wide range of P_H values (2 to 10·5), but adjustments had to be made before inoculation into *Nicotiana glutinosa* leaves, since at the extremes of the scale the excessive acidity or alkalinity of the inoculum was toxic to the leaf cells. Attempts to free the virus from proteins by protein precipitants or electrolysis, and also by proteolytic enzymes, did not give satisfactory results, as difficulty was experienced in ensuring that the effect of some reagents was exerted on the virus and not on the tissues of the plants used for testing its activity.

VAN HALTERN (F.). **Control of Tomato seedbed diseases of southern plants.**—*Bull. Ga Exp. Sta.* 187, 39 pp., 1935.

From the results [which are fully discussed and tabulated] of large-scale experiments from 1931 to 1934 in the control of some important tomato diseases in Georgia, where there is an extensive cultivation of outdoor-grown plants for transplanting in the northern States such as Indiana [*R.A.M.*, xiii, p. 767], it is apparent that northern-grown seed (which is chiefly used) is the carrier and main source of the bulk of infection occurring in the southern plants. The early blight fungus (*Macrosporium* [*Alternaria*] *solani*) [ibid., xiii, p. 195], however, was found to overwinter in the soil, healthy seed planted in soil not previously used for tomatoes producing a sound crop, while another portion of the same seed in soil bearing tomatoes the year before yielded a blighted stand. In two tests bacterial canker (*Aplanobacter michiganense*) [ibid., xiv, p. 151] did not overwinter in southern Georgia. Certified seed lots in 1934 appeared to be much freer of disease than commercial seed, 42 per cent. of the plots of the former being entirely free from infection. Five minutes' immersion of the seed in 1 in 3,000 mercuric chloride is recommended, supplemented by spraying with Bordeaux mixture (2–3–50 when the second rough leaves start and 3–4–50 at fortnightly intervals for subsequent treatments) and by sanitary precautions against contamination. The experiments on which these recommendations are based are fully described.

Tubeuf [C. v.]. **Werdegang der Erforschung der sog. Ulmenkrankheit in Europa.** [The course of research on the so-called Elm disease in Europe.]—*Z. PflKrankh.*, xlv, 2, pp. 49–78; 4, pp. 161–189, 12 figs., 1935.

The course of the investigations on the dying-off of elms (*Ceratostomella ulmi*) in Europe is traced from the first mention of the disease in the Dutch literature in 1921 [*R.A.M.*, i, p. 277; xi, p. 610] to the present time. The more important papers on the subject are briefly summarized and discussed in the light of the author's personal observations and studies in the Munich district. In conclusion attention is drawn to the hitherto unexplained part played by the ubiquitous *Pseudomonas lignicola* [ibid., xii, p. 194] in the etiology of the disease.

Lüstner (G.). & Gante (T.). **Bemerkungen zum Ulmensterben.** [Observations on the dying-off of Elms.]—*Z. PflKrankh.*, xlv, 2, pp. 79–97, 1935.

A perusal of the relevant literature, supplemented by personal observations at Geisenheim (Rhine), has convinced the writers that elm trees contracting the so-called dying-off in a spasmodic or chronic form possess some inherent natural tendency or predisposition to infection by the causal organism (*Ceratostomella ulmi*) [see preceding abstract]. Such a character may be conditioned either by native varietal susceptibility or by adverse external conditions, especially drought. In this connexion mention is made of the uniformly excellent health and vigour of a group of elms situated beside a stream near Geisenheim, in contrast to the diseased state of others in drier sites. The theory that *C. ulmi* is a facultative parasite, requiring enfeeblement of the host to effect penetration, is said to have been confirmed by the results of inoculation experiments in Holland [*R.A.M.*, xiii, p. 549], Berlin-Dahlem [ibid., xi, p. 274], and Geisenheim, in which the symptoms thus artificially induced had completely disappeared a year after the trials.

Kalandra (A.) & Pfeffer (A.). **Ein Beitrag zum Studium der Ulmengraphiose.** [A contribution to the study of Elm graphiosis.]—Reprinted from *Lesn. Práce,* xiv, 17 pp., 4 pl., 1935. [Czech, with German summary. Abs. in *Rev. appl. Ent.*, Ser. A, xxiii, 5, p. 228, 1935.]

Dutch elm disease (*Ceratostomella ulmi*) is stated to have been first observed in Czecho-Slovakia [*R.A.M.*, xiv, p. 264] in 1931 in the province of Bohemia, whence it spread to other parts of the country. The species affected are *Ulmus campestris*, *U. effusa*, and to a lesser extent *U. montana*. The fungus is readily transmitted by Scolytids (chiefly *Scolytus multistriatus*, *S. scolytus*, and *S. pygmaeus*), both larvae and adults of which harbour it in their digestive organs, the latter also bearing it externally. Favourable conditions for bark beetles were created by the weakening of elms consequent on the severe winter of 1928–9, a decline in the abundance of birds, and the accumulation in forests of large numbers of felled, unbarked trees. All infested trees, even those only slightly attacked by beetles, should be cut down and barked or submerged for several weeks in water to destroy the larvae

and pupae [cf. ibid., xiii, p. 352]. In Bulgaria, where elms killed by *C. ulmi* were found in 1934 [ibid., xii, p. 252; xiv, p. 264], *S. sulcifrons* and *S. affinis* are also involved in the transmission of the fungus.

WORTHLEY (L. H.). **The Dutch Elm disease eradication project: Federal, State, and local co-operation.**—*Circ. U.S. Dep. Agric.* 353, 4 pp., 1935.

In this paper, designed primarily for landowners and for municipal and county officials concerned with the care of shade trees, the writer briefly outlines the various ways in which the public can assist the Governmental agencies in the control of Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) in the United States [*R.A.M.*, xiv, p. 406]. These include location of diseased elms, collection of elm insects, sanitation work and care of the elms. Plans are being made for systematic scouting of the area within 50 or 60 miles of New York City and other areas known or suspected to be liable to infection. Suspected cases will be examined in the field and confirmed at the laboratory. The list of all verified cases is submitted to the proper State official for arrangement with the owner for eradication and burning. A concerted effort is being made to remove all dead or dying elm trees and cut and fallen elm wood in or near the main infected area as liable to support the insect carriers and possibly the fungus. Standing elms should be kept in as good condition as possible as the bark insects prefer trees of low vitality [see preceding abstracts].

CARTER (J. C.). **Cytosporina canker on American Elm in Illinois nurseries.**—*Plant Dis. Reptr*, xix, 2, pp. 14–16, 1935. [Mimeographed.]

Among the fungi isolated from diseased elms by members of the Illinois State Natural History Staff since 1930, species of *Coniothyrium* and *Phoma* are stated to account for 27·5 and 13·2 per cent., respectively, of the total obtained during the four-year period under review [*R.A.M.*, xii, p. 124]. In July, 1934, a *Cytosporina*, provisionally identified as *C. ludibunda* [ibid., xiv, p. 453], was found fruiting on diseased American elms [*Ulmus americana*], this being only the second record of its occurrence on the same host in the State. The fungus is not listed by Seymour in his 'Host Index' on elm in North America, while Saccardo ('Sylloge Fungorum') gives *Ulmus* as a host but does not include North America in its range. *C. ludibunda* was estimated to be responsible for 24·76 per cent. of the total number of elm cankers in three plots examined in 1934, compared with 13·34 per cent. for *Phoma* and 61·90 per cent. of undetermined origin.

COLE (J. R.). **Gnomonia nerviseda, the perfect stage of the fungus that causes the vein spot of Pecan foliage.**—*J. agric. Res.*, l, 1, pp. 91–96, 2 figs., 1935.

A Latin diagnosis and English description are given of *Gnomonia nerviseda* n. comb. which cultural studies and pathogenicity tests showed to be the perfect stage of *Leptothyrium nervisedum*, the cause of the vein spot disease of pecan (*Carya pecan*) in the United States [*R.A.M.*, xii, p. 798]. The fungus differs morphologically from other

species on the same host, namely, *G. setacea* (Pers.) Ces. & de Not. var. *macrospora* E. & E. and *G. caryae* var. *pecanae* [ibid., xiii, p. 410], and is characterized by mostly hypophyllous, ellipsoidal, single or gregarious perithecia, 250 to 275 by 160 to 185 μ in diameter, with beaks measuring 200 to 300 by 75 to 100 μ. The asci are thin-walled, hyaline, cylindrical, 36 to 42 by 8 μ, with a pore at the apical end, and contain eight curved uniseptate ascospores, constricted at the septum, 14 to 15 by 4 to 5 μ in diameter, and with gelatinous appendages at each end. Paraphyses are not present.

In nature the pycnidial stage of the vein spot fungus does not develop until summer or early autumn, while the ascogenous stage appears the following spring on old vein spot lesions on fallen leaves.

SMITH (C. L.), ALBEN (A. O.), & COLE (J. R.). **Progress report of Pecan roset control experiments in Texas.**—*Proc. Tex. Pecan Grs' Ass. 1934*, pp. 41–46 [?1934. Abs. in *Chem. Abstr.*, xxix, 11, p. 3764, 1935.]

Pecan [*Carya pecan*] rosette was controlled in the latest of the continuous series of experiments proceeding in Texas [*R.A.M.*, xii, p. 339; cf. also xiii, p. 812] by three to four applications of zinc sulphate at the rate of 1 lb. in 50 galls. water. The application to the ground of the same preparation was less satisfactory, especially in the case of calcareous soils. Promising results were obtained by injecting dry zinc sulphate, at the rate of 15 to 45 gm. per sq. ft. of cross-section area of the tree trunk, through holes about 2·5 in. deep spaced in a spiral round the tree at horizontal distances of 3 to 6 in.

VARADARAJA IYENGAR (A. V.). **Deamination in virus-infected plants.**—*Nature, Lond.*, cxxxv, 3409, p. 345, 1935.

A distinct increase in hydroxy acid (especially malic) formation was observed to be a feature of the tissues in the early stages of sandal (*Santalum album*) spike [*R.A.M.*, xiv, p. 477] in south India. At a more advanced phase succinic acid was found to be present in the diseased tissues but entirely absent from healthy ones. The presence in the infected plants of an active deaminase being suggested by these phenomena, Kisch's method (*Fermentforsch.*, xiii, p. 433, 1932) was used for a series of quantitative studies, the results of which showed that the amounts of ammonia and carbon dioxide (in c.c. $N/50$) produced by 1 gm. of spiked leaf powder in 14 hours were 9·2 and 16·8 respectively, the corresponding figures for the same quantity of healthy leaf powder being 1·2 and 5·1, respectively. It is apparent from these data that the increased production of ammonia in spiked tissues is due to greater oxidative deamination.

VARADARAJA IYENGAR (A. V.) & RANGASWAMI (S.). **Studies in the control of spike disease. Part I. The role of infection centre and Lantana in the spread of disease. Part II. Use of plant poisons in controlling the spread of infection.**—*Indian For.*, lxi, 1, pp. 25–34; 2, pp. 103–111, 1 diag., 1 map, 1935.

In the North Salem Division of the Madras Presidency the number of sandal [*Santalum album*] trees affected by spike disease [see preceding

and next abstracts] was found in 1932–3 to have risen to 54,799 from 15,219 in 1917, and it is estimated that the death-rate from spike is more than ten times that due to other causes. The usual method of checking spread is to eradicate the diseased trees and burn them after rough-cleaning for the valuable scented heartwood. This is effective when executed immediately upon the detection of spike. Where the disease has been allowed to flourish unchecked it is stated to be scarcely possible to obtain a tree with a girth of 15 in. and upwards, and in one locality where 45 trees on an average yielded 1 ton of heartwood in 1922–3, it was necessary to uproot 332 in 1929–30 to make up the same quantity. The invasion of the sandal areas by *Lantana* [*camara*], a host very liable to induce spike in sandal [*R.A.M.*, xii, p. 129], is increasing; in four areas of the North Salem Division the acreage under *L. camara* increased from nil, 45, 1,472, and 2,005 in 1917 to 20,844, 37,524, 45,806, and 35,090 respectively, in 1931.

Various chemicals have been tested for their value in eradicating spiked trees, in comparison with the patented arsenical Atlas tree-killer, by injection through holes, girdling and smearing, or incision. Potassium and sodium chlorates were moderately effective but rather slow in action. Of 60 trees treated with Atlas and water (1 : 1) 14 were dead in three weeks and all in four months. The efficacy of this preparation is influenced by seasonal conditions, being reduced during the monsoon. Among the pure salts of arsenic tested [ibid., xiv, p. 477] potassium arsenite ($2\frac{1}{2}$ lb. per gall.) was the most effective, killing 7 out of 15 trees in three weeks and all in four months. Somewhat less satisfactory results were given by sodium arsenite. Of the other preparations tried the most efficient were arsenic chloride in dilute hydrochloric acid and arsenic oxide in caustic soda. The latter at a strength of 4 lb. As_2O_3 and 1 lb. NaOH per gallon water has been used on a large scale in the forests of North Salem and Coorg with promising results.

VENKATA RAO (M. G.). **The role of undergrowth in the spread of the spike disease of Sandal.**—*Indian For.*, lxi, 3, pp. 169–188, 1935.

After discussing the distribution of sandal spike in South India [see preceding abstracts] and its relation to the associated undergrowth [*R.A.M.*, xiv, p. 265], the author states that spike-like diseases have been observed in *Zizyphus oenoplia*, *Dodonaea viscosa* [ibid., x, p. 495], *Stachytarpheta indica*, and *Vinca rosea*, but attempts at transmission by haustorial union [ibid., xiv, p. 204] have failed. By actually growing sandal from seed in infected areas, even plants of only nine months old and 1 ft. 3 in. in height contracted spike in the open, indicating that the minimum incubation period of the disease in nature is less than nine months. Spike has not been found, however, on young plants growing under bushes, suggesting that shade probably renders them more tolerant of the virus and also masks the symptoms. Tests on potted sandal plants in a heavily infected area have shown that the disease also travels above ground and insects are strongly suspected to be concerned in this aerial form of transmission. Negative results were given by all attempts to transmit infection through pollen and seed from partially spiked trees.

Jelutong. Damage by insects and fungi.—*Malay. Forester*, iii, 3, pp. 133–137, 1934.

Jelutong [*Dyera costulata*] timber, when carelessly stacked or left lying about in the jungle, is stated to be very liable to attack by a species of *Diplodium* [?*Diplodia*], causing a rapidly spreading greyish discoloration or blue stain. Infected planks may become permeated by the hyphae in a few days, as was shown by an experiment under conditions approximating to those obtaining in ill-ventilated stacks. Laboratory tests indicate that the fungus may reduce the strength of the timber by as much as 10 per cent., but this form of deterioration is relatively unimportant compared with the devaluation resulting from discoloration of the wood. A species of *Irpex* has been found to be responsible for a reddish stain in the early stages of decay.

Diller (J. D.). **The Atropellis canker of eastern Pines.**—*Plant Dis. Reptr*, xix, 2, p. 17, 1935. [Mimeographed.]

In 1932 a canker of pines (mostly Scotch [*Pinus sylvestris*]) was investigated in the Shawnee State Forest, Ohio. The disease appeared to be closely related to, but not identical with, that described on western white pine [*P. monticola*] from the Pacific North-west by Zeller and Goodding as due to *Atropellis pinicola* [*R.A.M.*, xiii, p. 685]. The disorder is stated to be widely distributed from the New England and Lake States to the Gulf States, and from the Atlantic coast to eastern Texas and Oklahoma. The evidence regarding the origin of the fungus is conflicting. Its development on so many native and exotic pines in the eastern States, together with the detection of old cankers throughout practically the whole range of the disease point to a native origin, but on the other hand, its rapid increase of recent years on certain American species in some localities rather denotes that a foreign introduction of several decades' standing is now assuming an epidemic form. For instance, in a nine-year-old slash pine [*P. caribaea*] stand 87 per cent. of the trees were infected and 29 per cent. of the branches were killed by the disease.

Finlayson (E. H.). **Report of the Director of Forestry 1933–4 (fiscal year ended March 31, 1934.).**—*Bull. For. Br. Can.*, 40 pp., 1934. [Received April, 1935.]

This report contains the following items of phytopathological interest in addition to those noticed from other sources. It is hoped to enlist the co-operation of the Federal and Provincial Governments and of interested industry to utilize unemployment relief labour in the work of currant and gooseberry eradication against white pine blister rust [*Cronartium ribicola*], an operation effectively performed in the eastern United States at a rough cost of 25 cents per acre [*R.A.M.*, xiii, p. 666]. It is estimated that the 11 billion board feet of white pine, of which 9·3 billion are of eastern [*Pinus strobus*] and 1·7 billion of western [*P. monticola*: ibid., xiv, p. 135], in Canada represent a value of $55,000,000.

Notes are given on the wood preservation experiments conducted with various materials, including brine from Late Muskiki (sp. gr. 1·345),

the impregnation of Jack pine [*P. banksiana*] sapwood with which effectively checked the growth of *Coniophora cerebella* [*C. puteana*].

TUBEUF [C. v.]. **Wo stehen wir mit der Erforschung des Blasenrostes der Weymouthskiefer?** [Where do we stand in the research on blister rust of the Weymouth Pine?]—*Z. PflKrankh.*, xlv, 4, pp. 190–210, 1 fig., 1935.

The writer's previous appeals for the control of *Cronartium ribicola* on white pine (*Pinus strobus*) in Germany [*R.A.M.*, xiii, p. 136] are recapitulated. Where the trees are actually diseased they must be eradicated; healthy stands may be perpetuated only by means of seed and natural regeneration. *P. peuce*, formerly believed to be immune from blister rust, can no longer be recommended as a substitute for the white pine since the discovery of its susceptibility [ibid., xi, p. 81]. The necessity for radical measures in combating the rust is strongly emphasized, all attempts to save the situation without sacrificing the existing diseased or suspected stands being condemned as totally inadequate.

BIRCH (T. T. C.). **A Phomopsis disease of conifers in New Zealand.**—*Bull. N.Z. For. Serv.* 7, 30 pp., 18 figs., 1935.

A full account, preceded by an introductory note by the Director of Forestry, A. D. McGavock, is given of the terminal wilt and canker produced on *Pinus radiata*, *P. muricata*, and *P. canariensis* at high elevations liable to severe unseasonable frosts in New Zealand by *Phomopsis strobi* [*R.A.M.*, xiv, p. 65], which is thought to have been probably introduced into the Dominion on American seed between 1927 and 1929 [ibid., x, p. 278].

The morphology of the fungus is discussed in relation to other species of *Phomopsis* pathogenic to conifers, and notes are given on its cultural characters on a number of standard media. The spores of the New Zealand form (in which the A-type only has been observed) are hyaline, unicellular, usually biguttulate, commonly elliptical to oblong-elliptical, sometimes irregular, measure 5 to 8·5 by 2 to 3 μ (mostly 5·2 to 6·7 by 2·5 to 3 μ), and are borne on small, irregular, generally subulate conidiophores, 4·4 to 7·5 by 1 to 2·5 μ. It is apparent from a study of the comparative dimensions of *P. strobi* and *P. pseudotsugae* [loc. cit.] that the two species are nearly related, and there is reason to believe that the New Zealand fungus may represent an intermediate strain with closer affinities to the former than to the latter.

The *Phomopsis* wilt is essentially a juvenile disease, rarely affecting trees beyond the age of ten years. There are four types of infection, of which one or other predominates according to the mode of injury preceding the attacks of the fungus (frost, snow, wounds, and the like). Pines commencing growth in the late spring, such as *Pinus ponderosa* and *P. murrayana*, are not susceptible to infection by *Phomopsis strobi*, while inoculation experiments on *Pinus radiata* in a locality free from unseasonable frosts (Palmerston North) gave negative results throughout the year. The importance of frost as a predisposing cause of infection was further proved by a test in which three-year-old trees of the same species (but not *P. ponderosa* or *P. murrayana*) succumbed to

inoculation with *Phomopsis strobi* following an hour's exposure to a temperature of 22° to 24° F.

GOLDIN (M. M.). Руководство по борьбе с домовым грибом. [Text-book on the control of house fungi.]—348 pp., over 250 figs. [including graphs and diagrams], Гос. Научн.-Техн. Издат. Строит. Инд. и Судостр. [State Scient. & Tech. Publ. Office for Construction and Shipbuilding], Moscow, 1934. [Received May, 1935.]

The chief aim of this book is to popularize among Russian building engineers and contractors all the information attained up to date concerning the morphology, biology, and control of house fungi and other timber-destroying or -staining organisms, in view of the extremely heavy and widespread damage done by them in recent years practically throughout the U.S.S.R., especially in densely populated centres. Its chief interest resides in the detailed discussion of all the factors and conditions that favour the development of the rots in houses and in stored timber, with technical recommendations for their elimination. Separate chapters deal at length with the chief preservatives for timber impregnation and methods for their application, and also with the best means for controlling the rots in infected buildings, the whole calculated to apply to working conditions prevailing in Russia at the present time.

[MOLL (F.)]. **Die Verwendung von Zinksalzen zum Holzschutz.** [The use of zinc salts for wood protection.]—*Holzmarkt, Berl.*, pp. 3–4, 27th March, 1935.

Attention is drawn to the great superiority of acid zinc fluoride and zinc fluosilicate over zinc chloride and other zinc compounds as timber preservatives. Estimated by weight, the toxic activity to wood-destroying fungi of the fluorine ion is nearly four times that of the zinc ion, and the efficacy of zinc fluoride and of zinc fluosilicate in proportion to that of zinc chloride is as 237 and 307, respectively, to 49. Fluralsil [*R.A.M.*, xi, p. 84], a zinc fluosilicate preparation of the Brand Dyeworks, is stated to be particularly effective for the general protection of mine timber and against dry rot [*Merulius lacrymans*].

CAMPBELL (W. G.). **The chemical aspect of timber research.**—*J. Soc. chem. Ind., Lond.*, liv, 14, pp. 302–306, 1 fig., 1 graph, 1935.

In connexion with a general discussion on the chemical aspect of timber research, Rudge's theory of ionic intrusion as a necessary preliminary to fungal decay [*R.A.M.*, xiii, p. 816; xiv, p. 139 and next abstract] is refuted on the basis of observations and experiments at the Forest Products Research Laboratory. It is pointed out that wood exposed to the protracted action of moderate heat bears a striking resemblance to that invaded by *Merulius lacrymans*, except for the darker colour of the latter, the same process of hydrolysis being at work in both cases.

RUDGE (E. A.). **The decay of wood.**— *J. Soc. chem. Ind., Lond.*, liv, 14, pp. 307–309, 1935.

Recapitulating his views as to the importance of ionic infiltration in the causation of timber decay [see preceding and next abstracts], the

author briefly considers the possible applications of the knowledge acquired in his investigations to the industrial aspects of timber chemistry.

CAMPBELL (W. G.), TAYLOR (K. FRIEDA), & BRYANT (S. A.). **Some observations on the action of certain calcium salts on wood with special reference to the 'inorganic infiltration' theory of decay.**—*J. Soc. chem. Ind., Lond.*, liv, 14, pp. 103T–105T, 1 diag., 1935.

Sufficient evidence is considered to be forthcoming from the writers' experiments on oak and tulip wood (*Liriodendron*) [*tulipifera*] [details of the technique and results of which are given] to show that calcium carbonate and other calcium compounds (acetate, chloride, hydroxide) in the presence of carbon dioxide are unable in the absence of decay-inducing organisms to initiate any changes that could reasonably be interpreted as incipient decay. The pleasing dark brown coloration imparted by the salts (and incidentally affording scientific proof of the efficacy of the traditional practice of liming for this purpose) cannot, in the writers' opinion, be so regarded. It is, however, quite possible that, under certain conditions, calcium salts in their diffusion through the wood react with the tannin in such a way as to counteract the inhibitory effects of the latter on fungal growth. Evidence to this effect, would, of course, lend a real significance to the process of calcium infiltration in industrial timbers.

VAN POETEREN (N.). **Over de voorschriften tot wering van plantenziekten in verschillende landen.** [On the regulations for the exclusion of plant diseases in different countries.]—*Landbouwk. Tijdschr., Wageningen*, xlvi, 571, pp. 135–139, 1935.

Attention is drawn to some anomalies in the regulations for the exclusion of plant pests and diseases in various countries and a plea advanced for their revision on a more rational and liberal basis. Exception is taken in particular to the general policy of framing the laws to suit the level of the countries with the lowest standards of scientific agriculture, and to the tendency to exaggerate the risks of introducing a pest or disease from one country to another.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, ix, 3, pp. 59–62, 1935.

AUSTRIA. Law No. 8 of 13th December, 1933, regulates the points left open by Federal Law No. 252 of 12th July, 1929, with regard to phytopathological legislation in the autonomous provinces ('Länder'). On the establishment of the presence of a disease or pest, the necessary control and disinfection measures can be prescribed by the provincial Government, which is authorized, under certain conditions, to arrange for co-operative steps to be taken by all communes and owners interested. A list of compulsorily notifiable diseases and pests will be published.

EGYPT. According to a communication addressed to the International Institute of Agriculture by the Royal Legation of Egypt, Rome, the

entrance into Egypt of the following plant diseases is prohibited [cf. *R.A.M.*, xii, p. 592]: citrus canker and blast or black pit (*Phytomonas* [*Pseudomonas*] *citri* and *P. citriputeale* [ibid., xii, p. 376], respectively); crown gall (*Bacterium tumefaciens*) of various fruits (including loquats and olives); potato wart (*Synchytrium endobioticum*) and powdery and common scab (*Spongospora subterranea* and *Actinomyces scabies*); and onion smut (*Urocystis cepulae*) [ibid., xiii, pp. 288, 743].

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, ix, 4, pp. 87–88, 1935.

BRAZIL. By Ministerial Resolution of 19th November, 1934, the importation from any country into the whole of Brazil of the following (among other) plants and parts thereof is prohibited [cf. *R.A.M.*, v, p. 448]: cotton seeds and bolls, banana suckers and pseudo-bulbs, coffee berries, coffee tree shoots, seeds and shoots of other Rubiaceae, cacao shoots, fruits, and seeds, sugar-cane shoots, buds, and seeds, and the seeds, bud grafts, and shoots of *Citrus*, *Poncirus*, *Fortunella*, and related Rutaceae. The restrictions on inter-State traffic in various plants are also summarized.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, vii, 4, pp. 39–42, 1935.

DENMARK. The following regulations in respect of potato importation into Denmark, superseding those of 21st July, 1927 [*R.A.M.*, vii, p. 287], take effect from 1st March, 1935. Potatoes from countries in which wart disease (*Synchytrium endobioticum*) is known to have occurred during the last ten years may not be imported. Importation from other countries is permitted subject to the usual safeguards, including a statement to the effect that the consignment is free from wart disease and originated in a locality at least 5 km. distant from any place infested by the fungus during the last ten years.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements October–December 1934.—pp. 105–112, 113–115, 1935.

Summaries are given of the plant quarantine import regulations in Poland [*R.A.M.*, v, p. 256] and Palestine [ibid., xiii, p. 672].

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Modification of White Pine blister rust quarantine regulations. Amendment No. 1 to revised rules and regulations supplemental to notice of quarantine No. 63.—2 pp., 1935.

As from 15th March, 1935, Minnesota is included in the list of States (now 10) for which special control-area permits, issued by the local representative of the Bureau of Entomology and Plant Quarantine, are necessary for the importation of currant or gooseberry bushes of any species or variety into districts outside the legally established blister rust [*Cronartium ribicola*] control area [*R.A.M.*, xii, p. 400].

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CLARKE (H. R.). **Saving a million crossties a year.**—*Rly Engng Maint.*, *1935*, 2, pp. 76–78, 90–91, 2 figs., 1935.

The first treated sleepers on the Chicago, Burlington, and Quincy Railway in 1899 received ½lb. zinc chloride per cu. ft. of wood (Burnettizing process). Since 1902 a certain number of the treated sleepers were done by the Card process (½ lb. zinc chloride and 3 lb. creosote per cu. ft.) [*R.A.M.*, xii, p. 670]. From 1908 the latter process was more extensively used, while a limited number of the southern pine [*Pinus palustris*] sleepers have been preserved with Grade 1 creosote to a net absorption of 5 lb. per cu. ft. Besides these sleepers treated at company-owned plants, some 7,400,000 impregnated by the Card and Burnettizing processes at commercial installations have been utilized on the railway, making a total since 1899 of about 61,650,000 treated sleepers. In a general way the use of the Burnettizing method is indicated in the semi-arid territories west of the Missouri river and that of the Card in the areas of heavier rainfall to the east. These processes were used until 1930 when a change to the Rueping method—50 per cent. creosote and 50 per cent. petroleum, with a retention of 8 lb. per cu. ft. of wood [ibid., xiv, p. 205]—was considered to be economically justifiable in the confident expectation of obtaining a service life for the sleepers of 25 years in comparison with the 18½ year record hitherto established at an annual saving per sleeper of $0·0270 [ibid., xi, p. 685].

BADE (O.) & KLEM (P.). **Sopp i tremasse.** [Fungi in ground wood-pulp.]—*Papirjournalen*, xxiii, 4, pp. 39–44; 5, pp. 47–49, 6 figs., 1 graph, 1935.

These two papers with the same title deal from a technical standpoint with the various pulp-grinding systems used in Scandinavian paper factories in relation to the problem of fungal infection [primarily by the blue-staining organisms, *Ceratostomella* or *Ophiostoma* spp., *Cadophora fastigiata*, *Lecythophora lignicola*, *Pullularia pullulans*, *Trichosporium heteromorphum*, &c.: *R.A.M.*, xiv, pp. 140, 274].

KUPKE (W.). **Versuche mit der Ceresan-Nassbeize im Gemüsebau.** [Experiments with ceresan liquid disinfectant in vegetable cultivation.] —*Nachr. SchädlBekämpf.*, *Leverkusen*, x, 1, pp. 46–50, 1 fig., 1935.

Attention is drawn to the excellent control of club root [*Plasmodiophora brassicae*] of Savoy cabbage (Eisenkopf variety) and Erfurt Dwarf

cauliflower obtained in the Breslau district of Germany in 1932 by two to three treatments with 0·1 to 0·15 per cent. liquid ceresan (U. 564) [*R.A.M.*, xiv, p. 20], the first applied to the soil of the seed-bed at sowing and the last to the seedlings a day or two before transplanting; the latter operation should be followed in six to eight days by a further treatment at 0·1 per cent. At present prices the cost of disinfection of 8,000 plants, covering ¼ hect., amounts to M. 20, exclusive of labour.

De Bruyn (Helena L. G.). **De invloed van bemesting op de aantasting door Peronospora parasitica bij Kool.** [The effect of manure on the infection of Cabbage by *Peronospora parasitica*.]—*Tijdschr. PlZiekt.*, xli, 3, pp. 57–64, 1 pl., 1935. [English summary.]

Experiments were carried out to attempt to reconcile the conflicting results obtained by Quanjer in Holland and Chupp in the United States with regard to the effect of manuring on the infection of cabbage by *Peronospora parasitica* [*R.A.M.*, ix, p. 695].

The variations in physiological characters between the eleven strains of the fungus used were negligible when they were grown in monoconidial cultures on sterile seedlings, except for the sexual differences already reported [ibid., xiv, p. 415]. Light was found to exert a significant effect on the incidence of infection resulting from the inoculation of cabbage seedlings on nutrient agar in sterile glass tubes, susceptibility to the fungus being at a low ebb during the dark winter months and increasing with the lengthening days. The composition of the nutrient solution seemed to be of relatively minor importance, and in further tests on cabbage and cauliflower seedlings grown from seed from differently manured parent plants and also on full-grown differently manured plants no clear-cut differences in reaction to infection by *P. parasitica* were apparent as a result of the manuring. The fungus was found to be capable of attacking chlorotic cotyledons and etiolated leaves and petioles of full-grown cabbage plants throughout the year [ibid., v, p. 643], while green seedlings are infected only with difficulty or not at all during the winter months. Inoculation tests on *Cheiranthus allioni* in tubes were successful only on yellow, dying foliage.

It is concluded from these results that a special equilibrium of substances in the host cells is essential to invasion by *P. parasitica*, the condition of the chlorophyll also being a decisive factor. The effect of manuring is purely secondary. Thus, cabbage plants deprived of potash in a test plot in 1931 showed more dying foliage than those receiving potash, but *P. parasitica* was present in a virulent form on the few wilting leaves of the potash-treated plants. These results, by showing the preponderant influence of factors other than nutritional on the severity of infection, may partially explain the discrepancies in the observations of previous workers.

Gibbs (J. G.) & Brien (R. M.). **The host range of Phoma lingam. Its significance to Swede production in New Zealand.**—*N. Z. J. Agric.*, l, 3, pp. 172–174, 1 fig., 1935.

The authors state that *Phoma lingam* [*R.A.M.*, xiii, p. 487] was isolated in 1934 in New Zealand from a stem canker on a wild turnip

(*Brassica campestris*) plant, and from leaf spots on rape, cabbage, and cauliflower seedlings. Hypodermic inoculations with single-spore cultures of the fungus caused infection on cultivated *Arabis albida* and *Cheiranthus cheiri*, and on *Matthiola incana*, *Raphanus sativus*, *Sisymbrium orientale* and various other weeds or escaped plants. It is pointed out that of the weed hosts, wild turnip alone is common in farm land; the remaining hosts are not likely to be of significance as sources of infection of swedes or turnips, since they are either rare or of limited distribution in the fields, and have not yet been found to be naturally infected by *P. lingam*.

MACLEOD (D. J.) & HOWATT (J. L.). **The control of brown heart in Turnips.**—Abs. in *Sci. Agric.*, xv, 6, p. 435, 1935.

In addition to sodium tetraborate (borax) at the rate of 10 lb. per acre, kelp [ashes of seaweed], farmyard manure, and sulphur at doses of 20 and 40 tons and 1,000 lb. per acre, respectively, gave moderately satisfactory results in the control of brown heart of turnips, stated to be a limiting factor in production, in recent experiments in eastern Canada [*R.A.M.*, xiii, p. 536].

TAKIMOTO (S.). **On the three species of Ascochyta on Pisum sativum.**—*Ann. phytopath. Soc. Japan*, iv, 3–4, pp. 172–177, 3 figs., 1935. [Japanese, with English summary.]

The writer designates as 'blight', 'brown spot', and 'foot rot', respectively, the pea diseases caused in Japan by *Ascochyta pisi*, *Mycosphaerella pinodes*, and *A. pinodella* [*R.A.M.*, xiv, p. 428], of which *M. pinodes* (the only one found in the ascigerous stage on the host or in culture) is the most destructive. *A. pisi* produces on the leaves pale tan, marginate lesions distinct from the purplish-brown, irregular spots caused by the other two species. *A. pinodella* and *M. pinodes* form black lesions on the base of the plants, which is further liable to severe rotting by the former, whereas *A. pisi* does not attack this part.

YOSHII (H.) & MASANO (N.). **On the effect of the staled culture solution of Fusarium niveum to the transpiration of Soy Beans; a criticism to Linford's suggestion.**—*Ann. phytopath. Soc. Japan*, iv, 3–4, pp. 137–144, 1 graph, 1935. [Japanese, with English summary.]

Contrary to Linford's results with filtrate of *Fusarium orthoceras* var. *pisi* from peas [*R.A.M.*, xi, p. 85], the writers found that the decrease of transpirational capacity in cut soy-bean plants placed in staled liquid cultures of *F. niveum* [ibid., xiv, p. 420] runs parallel with the progress of wilting.

PETHERBRIDGE (F. R.) & STIRRUP (H. H.). **Pests and diseases of the Sugar-Beet.**—*Bull. Minist. Agric., London*, 93, v+58 pp., 16 pl., 1 diag., 1935.

In the second part of this bulletin [which in an editorial foreword is stated to be the outcome of the authors' visit during the summer of

1934 to the chief Continental sugar-beet growing areas] Stirrup gives notes on the symptoms, etiology, distribution, and control of the more important European diseases of the sugar beet, including blackleg associated with *Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis* [*R.A.M.*, xiv, pp. 209, 281]; 'strangle' or 'girdling' (known as 'fall', in Denmark), due to superficial attacks of *P. betae*, as well as to insects and to certain physiological or mechanical causes; heart rot and dry rot associated with boron deficiency [see below, p. 551]; non-virus types of yellows due to various causes [see next abstract], namely, that caused by an as yet undetermined species of *Pythium* [ibid., xiv, p. 209], that due to manganese deficiency, one-sided yellows, apparently caused by a species of *Fusarium* or of *Verticillium*, and leaf scorch, due to unsuitable soil conditions; downy mildew (*Peronospora schachtii*); powdery mildew (*Microsphaera betae*) [ibid., x, p. 152], which has not yet been recorded on the crop in England; leaf spots associated with *Cercospora beticola*, *Ramularia beticola* [ibid., viii, p. 696], and *Phyllosticta* (*Phoma*) *betae* [ibid., xiii, p. 210]; rust (*Uromyces betae*) [loc. cit.]; violet root rot (*Helicobasidium purpureum*) [loc. cit.]; scab (*Actinomyces* spp.) [ibid. xi, p. 25]; crown gall (*Bacterium tumefaciens*); and root tumour (*Urophlyctis leproides*) [ibid., xii, p. 537]. The disease of young sugar beet plants caused by *Typhula betae* [ibid., v, p. 590] has not yet been recorded in England.

The virus diseases discussed comprise mosaic [ibid., xiv, p. 72], which so far has only been occasionally recorded on sugar beets in England, yellows (for which the name 'virus yellows' is suggested to distinguish from other types of the condition), and crinkle. Virus yellows [ibid., xiv, p. 342] has been known to exist in most European countries (possibly also in England) for some years, and appears to be now becoming much more widespread; its distribution in the field occurs most commonly through the agency of *Aphis fabae*, though other insects may also be implicated. Crinkle is in some respects similar to the American curly top disease of beets. So far it has not been recorded from England, and is apparently confined to certain parts of Poland and to the area in Germany [ibid., ix, p. 153] between Silesia, where it was first observed in 1903, and Anhalt where it appeared in 1916; it does not seem to occur elsewhere in Europe, although Neuwirth has described a virus disease with similar symptoms from Czecho-Slovakia [ibid., vi, p. 10]. The field transmission of the disease is effected by the Tingid insect *Piesma quadrata* [*Zosmenus quadratus*], which also feeds on certain weeds such as *Chenopodium glaucum* and on spinach; on the latter (but not on *C. glaucum*) it produces symptoms of the crinkle type. It was shown by Kaufmann that the larval stages of *Z. quadratus* are unable to transmit the virus, but that adult insects after feeding once on affected beets retain infectivity throughout their life, and are able on emerging from hibernation in the spring to infect the new crop of seedlings with the virus obtained by them from the preceding crop. Local growers state that the disease causes greater losses (up to 60 per cent.) to the crop than all the other diseases and pests put together. It was experimentally shown that it heavily reduces the total sugar yield of the affected beetroots, some actual figures quoted being 8 gm. average total sugar per root in the severely diseased as against 60·3 gm. in the healthy roots.

De Haan (K.) & Roland (G.). **Enquête internationale sur les différents types de maladies de jaunissement et de mosaïque de la Betterave sucrière quant à leurs caractères et leur influence sur la végétation.** [An international inquiry into the different types of yellowing and mosaic diseases of Sugar Beet in respect of their properties and influence on growth.]—*Publ. Inst. belge Amélior. Better.*, iii, 2, pp. 55–67, 1935. [Flemish, German, and English summaries.]

A summary is given of the results, presented at the fifth meeting of the International Institute of Beet Research at Brussels in January, 1935, of an international inquiry, organized by the Belgian and Dutch beet improvement societies, into the symptoms, etiology, economic importance, distribution, and possibilities of combating the various forms of yellowing and mosaic affecting the crop in Belgium and Holland [see preceding abstract].

Much of the information collected has been noticed from time to time in this *Review*, but attention may be drawn to the following points. A distinction is made between the terms 'jaunisse' ('yellow spot') and 'jaunissement' ('yellowing'), the former being reserved for a virus disease of the mosaic type while the latter is applied in a more general sense to physiological chloroses. The manganese deficiency disease, not yet recorded in Belgium, is stated to be responsible for considerable losses among Dutch crops, amounting in some years to 6 or 8 per cent. of the yield [ibid., xiii, p. 675]. Calcareous soils with an abnormally high humus content and heavily limed sandy soils appear to be specially affected. The very prevalent form of yellowing associated with translocation obstruction and starch accumulation [ibid., xiv, p. 209] is reported to have caused losses of 20 to 30 per cent. in Belgium in 1933, while in Holland the yield reduction from this disorder may be 16 per cent. In Holland mosaic has been observed rather more frequently on fodder than on sugar beets; counts in a Belgian varietal reaction plot in 1934 revealed an incidence of 0·3 to 10 per cent. infection. Yellowing due to *Verticillium* and *Fusarium conglutinans* var. *betae* [ibid., x, p. 428], ordinarily of little importance in Holland and Belgium, was common in the latter country at the end of August, 1934, presumably on account of the drought since the symptoms more or less disappeared following rain.

Schmidt (E. W.). **Zur Physiologie und Pathologie des Vergilbens der Zuckerrübenblätter.** [Contribution to the physiology and pathology of the yellowing of Sugar Beet leaves.]—*Z. wirtschaftsgr. Zuckerindustr.* (formerly *Z. Ver. dtsch. Zuckerindustr.*), lxxxv, 3, pp. 200–214, 4 figs., 1935.

This is an expanded account of the writer's investigations in Germany on the various forms of yellowing in sugar beet foliage, a note on which has already been published [*R.A.M.*, xiv, p. 417 and preceding abstracts].

Bennett (C. W.). **Studies on properties of the curly top virus.**—*J. agric. Res.*, l, 3, pp. 211–241, 4 figs., 1 graph, 1935.

Continuing his investigations of the beet curly top virus [*R.A.M.*, xiii, p. 674] the author describes a method devised by him, in view of

the difficulty of obtaining infection with this virus of experimental hosts by mechanical inoculation [ibid., xii, p. 349], for the preparation of viruliferous material less toxic and more acceptable to the leafhopper (*Eutettix tenella*) vector than the juice extracted from affected beets. The phloem content of the beets, which is relatively rich in virus and can be collected in small quantities as natural exudate from the petioles and leaves, and in larger quantities from the cut surface of diseased beetroots [ibid., xiii, p. 675], is acceptable to the leafhopper, and it was also found possible to separate the virus in the ordinary juice from most of the material toxic to or not liked by the vector. The method employed consists in precipitating with 95 per cent. alcohol or acetone the virus contained in diseased beet juice, phloem exudate, or in suspensions of crushed infective leafhoppers, washing once the centrifuged precipitate with 50 per cent. alcohol, drying it, and making up to the original volume of juice with a 5 per cent. sugar solution. The supernatant liquid resulting from centrifugalization of this preparation contains considerable virus and is a favourable food for the leafhopper; it does not, however, contain all the virus present in the dried precipitate, since large amounts of it were obtained from each of several successive washings of precipitate from phloem exudate and from three successive washings of precipitate from beet juice. Experiments showed that the concentration of the virus was considerably greater in the phloem exudate than in beet juice, and somewhat greater than that in the leafhopper. Infection was obtained from 1 in 1,000 dilutions of the phloem exudate in tests in which one artificially fed leafhopper was placed on each plant, and from 1 in 20,000 dilutions from tests in which ten leafhoppers were used.

Studies of the properties of the curly top virus [cf. ibid., xiii, p. 285] indicated that it passes the common filters, such as the Berkefeld V, N, and W, and the Mandler medium and fine grades; its resistance to ageing in a liquid medium depends largely on the medium; in filtered and unfiltered beet leaf juice it was recovered after 7 days, in unfiltered wash of alcoholic precipitate of leaf juice after 14 days, and from filtered wash of this precipitate after 28 days. It remained active for 10 months in dried phloem exudate, 5 months in the alcoholic precipitate of this exudate, 4 months in dried beet tissue, and 6 months in dried beet leafhoppers. It withstood freezing for a period of 18 months and daily alternate freezing and thawing for three weeks in phloem exudate. The thermal point of inactivation lies between 75° and 80° C. No virus was recovered from liquids having a P_H value of 2·9 or lower; it was not inactivated by an alkaline reaction of the medium at least as high as P_H 9·1, and there was evidence that it occurs normally in an alkaline medium in both the plant and the insect vector. Absolute alcohol reduced but did not destroy the activity of the virus in two hours, and acetone had no apparent effect at any concentration; it also exhibits considerable resistance to a number of common disinfectants, such as copper sulphate (1 in 200), bichloride of mercury (1 in 50), formaldehyde (1 in 100), and carbolic acid (1 in 25). The expressed juice from beet and a number of other plant species was shown to be able to cause inactivation of the curly top virus in periods from 30 minutes to more than 14 days, according to the plant but apparently not correlated with its degree of resistance. This would suggest that, if the inactivating

substances in the expressed beet juice are derived directly from the plant, resistance in beet to curly top (the virus of which is believed to be more or less closely restricted to the phloem) [ibid., xiv, p. 487] is probably governed by the degree to which these substances are able to diffuse into the phloem.

BORISSEVITCH (G. F.). О загнивании корней Сахарной Свеклы вызываемом грибком. **Trichoderma koningi Oud.** [Note on the the root rot of the Sugar Beet caused by *Trichoderma koningi* Oud.] —*Научн. Зап. Сахарн. Промышл.* [*Sugar Industry Scient. Notes*], Kieff, xi [Red Ser.], 4–6 (Agron. Ser. 2–3), pp. 81–85, 1934. [English summary. Received June, 1935.]

Preliminary investigations showed that *Trichoderma koningi* [*R.A.M.*, xii, pp. 535, 593, 656; xiv, p. 332] and *T. lignorum* [ibid., xiv, p. 463] are very widespread both in the soil and on rotting sugar beets in silos in the Ukraine, and are also frequently associated with a premature withering and drying-up of mother beet transplants during all stages of development. Further studies indicated that infection with these fungi occurs chiefly at harvest time through mechanical injuries to the roots, as both were incapable of penetrating through the unbroken surface, and that the beet transplants may be infected from the soil after planting. In controlled experiments it was shown that *T. koningi* isolated from decaying roots rotted healthy beetroots much more actively than the strain of the fungus isolated from infected beet seed clusters, and still more so than *Phoma betae*, while *T. lignorum* produced no rot at all after forty days. Artificial inoculation of seed clusters with pure cultures of *T. koningi* only insignificantly increased the percentage of beetroot rot in the resulting seedlings, while inoculation with *P. betae* raised it from 10 (in the controls) to 60 per cent.; this suggests that *T. koningi* is not a factor in the seedling beetroot rot problem [cf. ibid., x, p. 425; xiii, p. 742]. Comparative Russian technical descriptions of *T. koningi* and *T. lignorum* are appended.

HUGHES (W.) & MURPHY (P. A.). **Crown rot of Sugar Beet a boron deficiency.**—*Nature, Lond.*, cxxxv, 3410, p. 395, 1935.

In a test in which ten sugar beet seedlings were grown in Crone's solution (P_H 6·2 to 6·5) without boron, and a further twenty with the addition of 1 mg. boric acid per l., the former rapidly developed such severe crown rot (without the intervention of *Phoma betae* or any other parasitic fungus) that three were dead and seven seriously diseased after a month, while the latter made normal, vigorous growth [*R.A.M.*, xiv, p. 282]. At this stage boric acid was supplied to the seven diseased plants and withheld from ten of the twenty healthy ones, with the result that the former recovered and the latter developed crown rot. Confirmatory results were obtained in two field experiments in Carlow, where the disease is severe locally, with 12 to 20 lb. borax per acre, the yield and value of the crop being almost doubled in one instance and increased by one-half in the other, and the sugar content raised by 1 to 3 per cent. The economic importance of this treatment is evident from the fact that the beet area of Leinster is affected by the disease to the extent of 30 per cent.

Solunskaya (Mme N. I.). Влияние бора на гниль сердечка Сахарной Свеклы. [Effect of boron on heart rot of Sugar Beet.]—*Научн. Зап. Сахарн. Промышл.* [*Sug. Ind. sci. Notes*], Kieff, xi [Red Ser.], 8–10 (Agron. Ser. 4–5), pp. 77–95, 5 figs., 3 graphs, 1934. [English summary. Received June, 1935.]

A full account is given of laboratory and field experiments from 1931 to 1933, inclusive, in the Ukraine, the results of which confirmed the efficacy of boron in the control of beetroot heart rot [see preceding abstract], and also showed that the presence of sufficient quantities of this element in the soil increases the sugar content of the crop. There was clear evidence that the increase in heart rot noticed by some former workers at higher P_H values (over 7) of the soil [*R.A.M.*, ix, p. 757] may be explained by a more vigorous development of the beet foliage, entailing a higher demand on the part of the plant in boron, since the disease did not develop in slightly alkaline media in the presence of sufficient doses of the element; the view, therefore, that boron is not assimilated by the beet in alkaline soils has no foundation in fact. Increase in soil moisture during the first half of the vegetative period stimulated leaf development and aggravated heart rot, but in some instances recovery of the plants resulted when the soil moisture was increased towards the end of the period.

Of the two beet lines, Kalnik (sugar beet) and Uladovka (fodder beet), which were tested, the former was the more susceptible to heart rot, although it appeared to be lower than the second in its boron requirement and more susceptible to injury from this element, a dose of 150 mg. of which per plant was capable of causing a depression of growth. The investigation also gave some indications that boron may be useful in the control of certain fungal diseases, both in the field and in storage.

Fron (G.). **Sur la désinfection des graines de Betterave.** [On the disinfection of Beetroot seeds.]—*C. R. Acad. Agric. Fr.*, xxi, 10, pp. 427–433, 1935.

Satisfactory control of *Sphaerella tabifica* [more usually known from the imperfect form *Phoma betae*: *R.A.M.*, xiv, p. 282] on beet seed clusters has been obtained by four or five hours' immersion in 1 in 20,000 cryptonol, a commercial preparation of the neutral sulphate of ortho-oxyquinoline $(C_9H_7ON)_2, H_2SO_4$ [*R.A.M.*, xiii, p. 690], followed by twelve hours' drying at 15° to 20° C. before sowing. Owing to the very low concentration at which cryptonol is used the expense of the treatment is negligible, the cost of sufficient material for the disinfection of seed clusters for 1 hect. amounting to barely Fr. 0·25.

Having regard to the stringent French laws against the use in agriculture of substances liable to injure human or animal health, the discovery of an innocuous substitute for germisan (obtainable only under special permit) is of general interest. The whole problem of the laws governing the agricultural use of toxic substances is briefly discussed by E. Saillard (pp. 422–426), who also contributes some comments (pp. 433–434) on Fron's results.

Walker (J. C.) & Link (K. P.). **Toxicity of phenolic compounds to certain Onion bulb parasites.**—*Bot. Gaz.*, xcix, 3, pp. 468–484, 1935.

The results of studies on the effect of twenty-one [listed] phenolic compounds on the growth in Czapek's solution of three onion bulb parasites, namely, *Colletotrichum circinans* [*R.A.M.*, xii, p. 672], *Botrytis allii* [ibid., xiv, p. 49], and *Aspergillus niger*, and also on *Gibberella saubinetii*, showed that in the phenol and phenolic acid series toxicity increased with molecular weight in the compounds in which the hydroxyls are arranged in ortho position to one another on the benzol nucleus, the reverse being true in those in which the hydroxyls stand in meta position to one another [cf. ibid., xiii, p. 645]. Phenol, catechol, and salicylic acid retarded the growth of all the fungi tested at dilutions considerably above the concentration inhibiting growth, while others, e.g., guaiacol, veratric acid, vanillic acid, and protocatechuic aldehyde, stimulated growth in dilutions but little over the inhibitive concentration. Although, as a general rule, *C. circinans* was the least and *A. niger* the most tolerant to each compound tested, the four fungi often showed much wider differences in their degree of tolerance to one compound than to another.

These results are interpreted to indicate that many phenolic substances widely distributed in plants exhibit little or no toxicity to certain parasitic organisms, and that therefore the mere presence of such substances in a host plant does not warrant the conclusion that resistance of the latter to a given parasite is conditioned by them [cf. ibid., xiii, p. 63]; this may only be true when a phenolic substance with specific toxicity to a given organism is present in an appropriate concentration in the host.

Bremer (H.). **Lagerschäden bei Zwiebeln.** [Storage injuries to Onions.] —*Kranke Pflanze*, xii, 3, pp. 35–38, 3 figs., 1935.

Popular notes are given on the rots of stored onions in Germany caused by *Botrytis*, *Sclerotium cepivorum*, and the slime ('Rotz') disease [*R.A.M.*, xiii, p. 614], attributable in the writer's opinion to bacterial agency.

Wellman (F. L.). **Dissemination of southern Celery-mosaic virus on vegetable crops in Florida.**—*Phytopathology*, xxv, 3, pp. 289–308, 3 figs., 2 diags., 1935.

The disorders induced by southern celery mosaic virus (celery virus 1) [*R.A.M.*, xiv, p. 93] in Florida have been found to spread in a generally characteristic manner in squash, pepper [*Capsicum annuum*], and celery fields, as well as among the weeds *Commelina nudiflora* and *Ambrosia elatior*. In maize the course of dissemination through the field is somewhat atypical.

In celery and similarly affected crops the first symptoms are usually seen on the edge of the field, where weeds or other crop plants constitute a source of infection. The disease spreads inwards through the successive development of small, scattered, coalescent areas that in turn result in further infection and the gradual formation of widely dispersed foci of contamination, perhaps ultimately involving the whole field. In maize

the bulk of infection occurs in young seedlings near the edges of the fields, older plants being free from attack. *Aphis gossypii*, moving from plant to plant or flying across the field, is the principal agent in the spread of the virus, dissemination being more rapid and extensive in the widely spaced squash and pepper crops than in the denser celery plantings, where the movement of the insects is somewhat hampered by the profusion of foliage.

HÜLSENBERG (H.). **Die Bekämpfung des Spargelrostes (Puccinia asparagi DC.) in der Provinz Sachsen.** [The control of Asparagus rust (*Puccinia asparagi* DC.) in the Province of Saxony.]—*Z. PflKrankh.*, xlv, 2, pp. 97–111, 1935.

This is an expanded account of the writer's proposals for the control of asparagus rust (*Puccinia asparagi*) in Saxony, the salient features of which have already been summarized from another source [R.A.M., xiv, p. 489].

AINSWORTH (G. C.). **Mosaic diseases of the Cucumber.**—*Ann. appl. Biol.*, xxii, 1, pp. 55–67, 3 pl., 2 figs., 1935.

In addition to the two cucumber mosaic diseases in England described by the author in a previous communication [*R.A.M.*, xiii, p. 648], namely, mild or ordinary mosaic (for which the standard name green-mottle mosaic of cucumber is suggested) caused by cucumber virus 3, and yellow mosaic (now renamed yellow-mottle mosaic) caused by cucumber virus 1 [cf. ibid., xiv, p. 400], a third, aucuba mosaic (which the author reterms yellow mosaic of cucumber), is caused by cucumber virus 4. The symptoms and virus properties of these three types are briefly described. Cucumber virus 4 has so far been found occurring naturally only on cucumber; it is filterable through Pasteur-Chamberland filters L1 to L7, resists ageing *in vitro* for nine months or longer, survives 80° C. for 10 minutes but is inactivated by 10 minutes' exposure to 90°, and is not inactivated by 50 per cent. alcohol in one hour. It was successfully inoculated into melon, on which is produced symptoms similar to those on cucumber, and into Florida Favourite and Dixie watermelon (*Citrullus vulgaris*) seedlings, causing a yellow mottle of the leaves and slight stunting of the plants. The paper also includes some notes on insect vectors of the diseases and on control measures.

CHAZE (J.) & SARAZIN (A.). **Contribution à l'étude de la môle, maladie du Champignon de couche. Essai de culture et d'infection.** [Contribution to the study of 'môle', a disease of cultivated Mushrooms. Cultural and infection tests.]—*C. R. Acad. Sci., Paris*, cc, 10, pp. 855–857, 1935.

Continuing their studies on the 'môle' [bubble: *R.A.M.*, xiv, p. 490] disease of the cultivated mushroom [*Psalliota campestris*] caused by *Mycogone* [*perniciosa*] and *Verticillium* sp. [ibid., xiv, p. 346], the authors describe experiments the results of which showed that the manurial compost used for the beds is not a suitable medium for growth of the two parasites until after it has been autoclaved. The spores of *M. perniciosa*, in particular, were shown to be killed within two days' sojourn in the mass of fermenting manure at a temperature around 70°C.

while they resisted a temperature of 70° for eight days and of 95° for four hours in a steam bath. When inoculated through wounds into the vigorously growing mushrooms, the *Verticillium* spores germinated fairly well on the surface, but the mycelium did not penetrate deeper; those of *M. perniciosa* appeared to be still less aggressive: only a few spores germinated around severely injured host cells, and in no case could the disease be reproduced by such inoculations under natural conditions; in the laboratory, however, the resistance of the mushrooms to infection was much lower.

These results are considered to indicate that the disease can only start in the underground mycelial strands of the mushrooms, a view which is supported by the fact that germinating spores of the parasites were seen by the authors in infected spawn. There also was evidence that the development of the disease is favoured by environmental factors tending to reduce the vigour of the spawn, such as excessive humidity, poor aeration, and the like; it was experimentally proved that the spores of the parasites germinated and grew well on spawn that had been killed by mechanical means or by alcohol. It is suggested that in mushroom beds the spores which are present on the surface of the earth cover germinate on organic débris decomposed by bacteria and on the spawn filaments of the mushrooms killed by any cause, from which infection then spreads to the living spawn and to the fructifying bodies.

WOOD (F. C.). **Note on Xylaria vaporaria.**—*Gdnrs' Chron.*, xcvii, 2518, p. 213, 1935.

At the Darlington nurseries, Worthing, it has been found quite practicable to eradicate *Xylaria vaporaria* from the mushroom [*Psalliota campestris* and *P. arvensis*] beds [*R.A.M.*, xiv, p. 346] by weeding it out, without, as commonly recommended, destroying the entire site. In many parts of the area recently affected (some 300 out of a total bed surface of 2,000 sq. ft.) the small, irregularly flattened, pinkish sclerotia of the fungus, smelling strongly of freshly cut cucumber, could be located lying flush with the surface of the casing soil, while elsewhere its presence could be detected by the odour of the latter. The mycelium of *X. vaporaria* was frequently found running in the compost in the upper layers of the bed, with a vigorous growth of mushroom spawn immediately below it. The former grows through the compost without changing its colour, whereas the latter imparts the white shade familiar to mushroom growers. As soon as the *Xylaria* sclerotia are removed, the bed is gradually filled up by the spawn and mushroom production proceeds normally.

DEMOLON (A.), BURGEVIN (H.), & MARCEL (M.). **Culture du Champignon de couche sur fumier artificial.** [The cultivation of the edible Mushroom on artificial manure.]—*C. R. Acad. Agric. Fr.*, xxi, 11, pp. 464–468, 1935.

Satisfactory yields of edible mushrooms [*Psalliota campestris* and *P. arvensis*] have been obtained by the writers at Versailles on a substratum consisting of wheat or oat straw with the addition of urea at the rate of 5 kg. per ton [cf. *R.A.M.*, xiv, p. 491]. Under the conditions used,

the humidity of the mass reached about 66 to 68 per cent. with a reaction of $P_H 6{\cdot}5$. The technique of preparing the synthetic manure for the beds is briefly indicated. The addition of 350 gm. potassium nitrate per 100 kg. of manure has been found advantageous.

HÉRANGER (S. F.). **Pulvérisations et mouillabilité.** [Spraying and wettability.]—*Rev. Vitic., Paris,* lxxxii, 2115, pp. 21–25; 2116, pp. 37–46; 2117, pp. 56–61; 2118, pp. 72–79; 2119, pp. 90–94; 2120, pp. 105–108; 2121, pp. 117–121, 1 fig., 5 graphs, 1935.

After pointing out the purely empirical nature of the methods hitherto employed for the appreciation of the degree of wettability of spray liquids [*R.A.M.*, xii, p. 138], the author briefly describes an apparatus ('mouillomètre') devised by him, with which he determined under strictly controlled conditions the factors involved in the display by a number of spray preparations of their full wetting capacity (wettability), i.e., the production by them after a certain duration of spraying of a continuous liquid film on the sprayed surface. He showed that of the five factors tested, namely, time (measured in seconds) of spraying, surface tension of the spray liquid, pressure used in the apparatus, size of jet, and distance of the sprayed object from the nozzle, the first alone is decisive in obtaining the desired effect, and that with Bordeaux and Burgundy mixtures without spreaders it required a minimum of six seconds, the addition of a spreader delaying it by fully a second [under conditions presumably comparable with those obtaining in usual spraying practice]. In discussing the theoretical principles embodied in his apparatus, he claims that it allows of determining directly the wetting capacity of a liquid in terms of a unit ('mouillance') of wettability, which he defines as the capacity of a liquid under strictly standardized conditions to form a continuous film over a surface of 1 sq. cm. in 1 second of spraying.

From a practical standpoint he states that his investigations have clearly demonstrated the entire inadequacy of modern spraying apparatus in the control of fungal diseases such as downy mildew [*Plasmopara viticola*] of the vine, since complete protection could only be obtained by spraying all the susceptible surfaces during a minimum of six seconds each, which is many times more than is practically possible. His conclusion is supported by his observations in nature, which showed that even in exceptionally well-treated vineyards only a maximum of 20 per cent. of the susceptible leaf and bunch surfaces were covered by the spray liquid immediately after spraying. High pressures are detrimental to the efficacy of spraying, since they only serve to reduce the wetting capacity of the liquids by too high fragmentation of the droplets, which of themselves have little wetting property and spread only by amalgamation with other droplets. The finer nozzles have the same effect. In his opinion, the whole practice of spraying is based on erroneous principles, and he suggests that new apparatus should be constructed on the principle of the ordinary watering-can rose, distributing the liquid not as a spray but in continuous streamlets the wetting capacity of which is very high. He believes that such apparatus should be both easy of construction and moderate in cost.

ZILLIG (H.). **Ausgestorbene und selten gewordene Rebenfeinde im deutschen Weinbau.** [Extinct and rare Vine pests in German viticulture.]—*Z. PflKrankh.*, xlv, 4, pp. 210–227, 1935.

The writer's observations, extending over a period of more than thirty years, principally in the Moselle vineyards, supplemented by a study of reliable nineteenth-century data, indicate the virtual disappearance from that region of the once formidable anthracnose (*Elsinoe ampelina*) [*R.A.M.*, xii, p. 596]. Particularly heavy damage was caused by this fungus between 1826 and 1841 and again in the 'seventies, and the importance widely attached to the disease in Germany is apparent from text-books and other records of the period. The last occasion on which anthracnose was reported in the Moselle was in 1909, and its decline thenceforward may be attributed to the general introduction about 1910 of systematic control measures against *Plasmopara viticola*. That the Bordeaux treatment has only been partially effective in the case of downy mildew is doubtless due to the capacity of the causal organism for repeated attacks (up to 20) in the course of the summer [ibid., xiii, p. 678], whereas *E. ampelina* can probably infect only once or twice during the same time. Brief notes are given on a few diseases of common occurrence to-day.

LÜSTNER (G.). **Auftreten der Schwarzfäule (Blackrot) der Rebe in Deutschland.** [Occurrence of black rot of the Vine in Germany.]—*NachrBl. dtsch. PflSchDienst*, xv, 3, p. 27, 1935.

A brief account is given of the symptoms, morphology, distribution, and mode of dissemination of black rot of the vine (*Guignardia bidwellii*), which is stated to have been observed for the first time in Germany on Oberlin 595 leaves near Karlsruhe by Ritschl (xiii *Jahresber. Bad. Weinbauinst.*, p. 54, 1933) and was detected on Riesling grape clusters sent from Rüdesheim to the Geisenheim (Rhine) Phytopathological Experiment Station in October, 1934. This North American fungus was first observed in Europe (France) in 1885 and has since been found in the Caucasus, Italy, and Spain.

TRINCHIERI (G.). **Asserzioni gratuite. Il 'black rot' della Vite in Italia?** [Groundless assertions. Vine black rot in Italy?]—*Coltivatore e G. vinic. ital.*, lxxxi, 9, pp. 230–232, 1935.

The author points out that there appears to be no evidence whatever for Lüstner's recent statement [see preceding abstract] that vine black rot (*Guignardia bidwellii*) occurs in Italy. The Italian quarantine law of 1927 [*R.A.M.*, vi, p. 639] forbids the import of cuttings of European and American vines from various countries expressly on account of this disease, the absence of which from Italy is, in point of fact, referred to in many recent Italian works on vine diseases, including the paper by Ferraris [ibid., xiv, p. 491] recording it in Jugo-Slavia, which appeared only about a month before Lüstner's.

MACDONALD (J. A.). **Plant pathology.**—*Scot. J. Agric.*, xviii, 2, pp. 164–167, 1935.

In trials of the reaction of marrow-stem kale [*Brassica oleracea* var. *acephala*] to *Plasmodiophora brassicae* [*R.A.M.*, xiii, pp. 9, 561] seven

varieties, representing distinct strains, together with commercial samples of green and purple marrow-stem kale were tested at the East of Scotland College of Agriculture. Four and a half months after sowing (in naturally infected soil to which was added infected turnip material) infection ranged from 16 per cent. in strain 4 to 28 per cent. in strain 5 and 30 per cent. in the commercial purple kale.

Tests of the effect on wheat germination of seed dusting with excess ceresan and agrosan G [ibid., xiii, pp. 502, 570] demonstrated that treatment with the latter at 3, 6, and 42 times the prescribed rate gave, respectively, 96, 97·25 and 88·5 per cent. germination under laboratory conditions, as compared with 97·25, 97, and 96·25 per cent., respectively, for the untreated control seed; under field conditions the treatments gave 89, 89, and 88·25 per cent. germination, as compared with 91, 90·25, and 90 per cent. for the untreated controls. With ceresan the figures for the laboratory test were 97, 96·75, and 85·25 per cent., and for the field test 89·5, 90, and 45 per cent.

NEILL (J. C.). **Some notes on plant diseases: made during a visit to Great Britain and Europe.**—*N.Z. J. Agric.*, l, 4, pp. 232–234, 1935.

Notes are given on the writer's observations on some plant diseases in Great Britain and on the Continent made during a visit in 1934. Seven of the nine seeding swede crops inspected in Great Britain were found to be attacked by dry rot [*Phoma lingam*: *R.A.M.*, xiv, p. 487], which was further present in all the 25 fodder swede crops examined (9 in northern England and 16 in Scotland), the incidence of infection being generally low but ranging from 80 to 90 per cent. in three crops. A disorder closely allied to that known as 'mottled heart' in New Zealand [ibid., vii, p. 418] appears to be on the increase in Great Britain. In Scotland it is particularly prevalent on the Ayrshire coast under the name of 'roan'. The same condition is reported from Holland, Germany, and Denmark, while the Canadian 'brown heart' (a limiting factor in swede production, experimentally shown to be curable to the extent of 80 per cent. by soil treatment with boron) [see above, p. 547] also appears to be identical. The rapidly extending use of marrow-stem kale (choumoellier) [*Brassica oleracea* var. *acephala*] as a substitute for swedes and turnips in Great Britain may be partially attributable to its resistance to *P. lingam* and club root [*Plasmodiophora brassicae*: see preceding abstract].

All the farmers visited in Scotland and Northern Ireland agreed as to the practical improvement over the older methods of the organic mercury dust treatment of oat seed-grain against leaf-stripe [*Helminthosporium avenae*: ibid., xiii, pp. 89, 365].

Meddelelser fra Statens Forsøgsvirksomhed i Plantekultur. [Notes from the State Agricultural Experimental Station.]—*Tidsskr. Planteavl*, xl, 4, pp. 616–686, 3 figs., 1935.

Among the twenty-five leaflets issued during 1934–5 by the Danish State Agricultural Experiment Station and here reprinted, the following are of phytopathological interest: No. 220 on potato varieties and potato diseases, an amplified version of which has been noticed [*R.A.M.*, xiii, p. 720]; No. 226 on bitter pit of apples [see below, p. 592]; No. 229 on the

winter spraying of fruit trees against common orchard pests and diseases; No. 237 on zonal rot of tulips (by Anna Weber and A. Lund); and No. 239 on spraying and dusting injury in the orchard.

Tulip bulbs affected by zonal rot show a soft, grey discoloration of the shoot bases, the diseased area frequently being separated from the healthy tissues above by a narrow, brown zone. The scales are more or less greyish with a darker grey to brown zone blending into the sound portions. The decay may be unilateral or the whole bulb may be involved. The growth of diseased bulbs may be arrested at various stages, sometimes not until the buds are about to emerge from the leaves. The roots are not generally affected at the commencement of the rot but their growth ceases as soon as the base of the bulb is reached. Among the varieties attacked are Prinz von Österreich, Brilliant Star, Bartigon, La Reine, and William Copland. An undetermined Pythiaceous fungus (not *Phytophthora cryptogea* or *P. erythroseptica*, reported as agents of a somewhat similar condition in England) [ibid., xii, p. 140] was isolated from diseased material and inoculated with positive results by various methods into wounded and unwounded bulbs of different standard varieties. The fungus reduced the germination of white cabbage, water-cress, beets, cucumbers, beans [*Phaseolus vulgaris*], and peas sown in infested soil, the maximum number of the three last-named developing under such conditions being 10 compared with 80 per cent. in healthy ground. An organism corresponding with the tulip pathogen was re-isolated from the surviving seedlings. Green tomatoes were also attacked, but with difficulty except through wounds. Zonal rot was less generally prevalent in 1934–5 than in the preceding season.

ADAM (D. B.). **Summary of plant disease records in South Australia for two years ending 30th June 1934.**—*J. Dep. Agric. S. Aust.*, xxxviii, 8, pp. 939–942, 2 graphs, 1935.

Stunting of wheat and oats, associated with *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xiii, pp. 295], continues to be reported, more especially from the mallee [*Eucalyptus* scrub] areas.

Brown rot (*Sclerotinia fructicola*) [ibid., xiv, p. 43] was recorded on peaches in 1932 (for the first time in South Australia since 1902) and on cherries in 1933. A fungus has been isolated from apricot trees suffering from progressive gummosis, affecting one limb after another and ultimately reaching the butt where the work of destruction is completed. Further studies on the disease are in progress.

RUSSELL (T. A.). **Report of the Plant Pathologist, 1934.**—*Rep. Bd Agric. Bermuda, 1934*, pp. 24–32, 1935.

A severe fruit rot of tomatoes, beginning as a brown bruised area near the stem end and finally involving the whole fruit, was found to be associated with a species of *Phytophthora*, inoculations with which on potato produced the tuber rot typical of *P. infestans*. Conversely, the latter organism from potato caused a fruit rot of tomatoes similar to that observed in nature, so that the disease newly recorded in Bermuda may safely be attributed to *P. infestans* [*R.A.M.*, xiv, p. 405].

A lily disease known as 'twist', characterized by excessive mottling and torsion of the leaves, has been responsible for heavy losses. It has

been tentatively regarded as a form of mosaic [ibid., xi, p. 97; cf. also xiii, p. 379], but the problem is complicated by the apparent soundness of the progeny of bulbs from badly diseased plants.

From sclerotia of *Sclerotinia sclerotiorum* [ibid., xiii, p. 356] kept over the summer on damp greenhouse soil apothecia were obtained on 22nd November, while the fructifications of another lot in a tin of soil exposed to the weather developed six or seven weeks later; none were found in the open, however, before January. The perpetuation of *Antirrhinum* [*majus*] rust [*Puccinia antirrhini*: ibid., xiv, p. 447] would appear to depend on the survival of the mycelium in individual plants through the summer, some evidence of which was obtained.

Beans [*Phaseolus vulgaris*] were attacked, for the first time since 1921, by *Bacterium phaseoli* [ibid., xiv, p. 415].

Carrots at the Agricultural Station were severely damaged in May by blight (*Macrosporium carotae*), reported from Long Island and Massachusetts as a cause of loss during exceptionally rainy summers [ibid., xiv, p. 399].

Sweet peppers [*Capsicum annuum*] were slightly damaged by leaf spot (*Cercospora capsici*) [ibid., xiv, p. 344].

Dark, concentric ring- or target-shaped lesions appeared on *Petunia* [*hybrida*] leaves in March, and the disease, evidently of virus origin [cf. ibid., xiii, p. 477] was transmitted to *A. majus* in which it caused the formation of pale, well-defined rings on the foliage.

UPPAL (B. N.). **Appendix K. Summary of work done under the Plant Pathologist to Government, Bombay Presidency, Poona, for the year 1933–34.**—*Rep. Dep. Agric. Bombay*, pp. 174–178, 1935.

During the period under review the D–ix strain of sunn-hemp [*Crotalaria juncea*] selected the previous year at Poona as resistant to *Fusarium* wilt [*F. vasinfectum*: *R.A.M.*, xi, p. 282; xiv, p. 144] maintained its resistance.

The *Alternaria* causing cumin [*Cuminum cyminum*] blight [ibid., xiii, p. 494] remains during the summer in the field on stubble; the spores preserved their viability for at least one and a half months when kept dry, but failed to germinate in an atmosphere of 100 per cent. humidity.

Bouisol and sulsol [ibid., xiii, p. 745] gave better control of fig rust [*Cerotelium fici*: ibid., xiii, p. 494] than Bordeaux mixture or sulphur, besides being non-injurious to the leaves.

When kerol [ibid., xii, pp. 420, 709; xiii, p. 12] was applied against *Sclerotium rolfsii* on potatoes at intervals of 7, 15, and 30 days at dilutions of 1 in 400, 800, and 1,200, at the highest concentration it killed or injured the plants, at the second it killed some but brought about an increased yield over the controls, while at the third it gave very satisfactory results, increasing the yield without causing injury.

Macrophomina phaseoli was isolated from 7 new hosts, making a total of 17 in the Presidency [ibid., xiii, p. 494]. On sorghum the fungus reduces the ear-head to about one-fifth its normal size; the disease was found to be appreciably influenced by soil conditions. The sorghum strain from Mohol Farm produces the pycnidial stage, though the Broach Farm strain does not. Under suitable conditions of soil moisture

and temperature it can kill linseed and cotton at any stage of their growth.

Cotton small leaf disease [?stenosis: ibid., xiv, p. 507] is widespread in the Presidency, where it causes serious damage, though its severity varies from year to year. The important symptoms are leaf dwarfing and sterility. That plants unaffected the first year become badly diseased in the first and second ratoons suggests that small leaf may belong to the virus group of diseases, but it has not yet been experimentally transmitted by insects or grafting.

The powdery mildew with endophytic mycelium on *Dolichos lablab* had much larger conidia and conidiophores than the similar type on other local hosts, including nasturtium and *Trigonella foenum-graecum*; the latter was probably *Oidiopsis taurica* [ibid., xiii, p. 375].

LEACH (R.). **Report of the Mycologist.**—*Rep. Dep. Agric. Nyasald, 1934*, pp. 24–26, 1935.

The collar scorch affecting one-year-old tea plants on the north side only of nursery beds during the cold weather of June was found to be a type of sun scorch, probably resultant on an exceptionally hot, dry May. *Rhizoctonia bataticola* [*R.A.M.*, xii, p. 538] was commonly isolated from the diseased areas, thereby confirming previous observations as to its low degree of pathogenicity, except under specialized conditions, on woody plants in Nyasaland, where the fungus is ordinarily represented by a member of Haigh's C group [*Macrophomina phaseoli*: ibid., xii, p. 727].

A disease of old coffee resembling that attributed by Storey to *Fusarium lateritium* [var. *longum*] in East Africa [ibid., xi, p. 712] was observed for the first time in Nyasaland in 1934. Under local conditions, however, the primary branches of the original stem are affected, whereas in Tanganyika infection is confined to the suckers sprouting from cut-back bushes.

The stem canker, angular leaf spot, and fruit scab and rot of mango, at first believed to be of fungal or bacterial origin but subsequently attributed to an insect [ibid., xiv, p. 14], have now been shown to be due to *Helopeltis bergrothi* [ibid., xiii, p. 327], which is also responsible for a fruit scab of avocado.

Agricultural research in Arizona. Forty-fifth Annual Report for the year ended June 30, 1934.—102 pp., 12 figs., 1 graph, 1934. [Received July, 1935.]

The following items of phytopathological interest, besides those already noticed from other sources, occur in this report. Promising results in the amelioration of citrus chlorosis [*R.A.M.*, xiv, p. 481] have been obtained by injecting ferric citrate through holes in the trunk, while a less rapid and possibly only temporary benefit followed soil applications of ferrous sulphate; the latter and ferric tartrate were also moderately effective as injections.

Several spray treatments were tested during the year against date fruit rot (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) [ibid., xiii, p. 92]. Copper acetate and lime-sulphur are both effective, and very satisfactory results were further obtained with 4–4–50 instant Bordeaux [ibid., xiv,

p. 349] with the addition of $\frac{1}{2}$ lb. per 400 galls of a spreader known as 'fluxit'. Infection by angular leaf spot [*Bacterium malvacearum*: ibid., xi, p. 511; xiv, p. 221] is stated to be generally prevalent and commonly overlooked in young Pima cotton crops, the primary attack on the cotyledons extending to the stems and there initiating the permanent blackarm phase. Severe losses (preventable by delinting the seed with sulphuric acid) [ibid., vii, p. 18] were caused by this disease in the Marana district. The occurrence of 'Waxahachie wilt' [ibid., xiii, p. 508] was reported from Perryville.

Among the shade trees and ornamentals responding with conspicuous success to soil treatment with ammonium sulphate for the control of root rot [*Phymatotrichum omnivorum*: ibid., xiii, p. 639] may be mentioned mulberry, pepper tree [*Schinus molle*], Arizona ash, Japanese and California privet [*Ligustrum ? japonicum* and *L. ovalifolium*], and *Cotoneaster* and *Pyracantha* spp., while *Sterculia* and *Casuarina* also react favourably but less rapidly. New hosts of the fungus include *Poinciana gillesii* [Hook.=*Caesalpinia gillesii* Wall.], *Feijoa sellowiana*, and *Acacia pendula*.

Milo sorghum in the Salt River Valley was attacked by a bacterial streak disease apparently due to *Bact. holcicola* [ibid., ix, p. 774]. The heads were dwarfed and the leaves bore water-soaked, later red streaks some $\frac{1}{12}$ in. wide and several inches long. Hegari, hitherto practically free from disease in Arizona, suffered locally from a stalk rot involving disintegration of the pith and general collapse; minute, black fruiting bodies of an undetermined fungus covered the vascular bundles.

Absolute control of wheat bunt [*Tilletia foetens*] was given by copper oxychloride (United Verde Company, Clarkdale, Arizona) [ibid., xiii, p. 751].

The most serious disease of strawberries in the State is the *Rhizoctonia* root rot [ibid., xiii, p. 785], to which the Missionary variety is highly resistant, in striking contrast to Klondyke and Arizona Everbearing; in the latter the lesions often extend right along the root and are much enlarged on the stolons.

Forty-seventh Annual Report Rhode Island State College Agricultural Experiment Station. Contribution 467.—*Bull. R.I. St. Coll.*, xxxi, 1, pp. 50–94, 1935.

This report contains the following items of phytopathological interest. Sweet corn [maize] showed only a trace of bacterial wilt [*Aplanobacter stewarti*: *R.A.M.*, xiv, p. 503] during 1934, in sharp contrast to the previous season when the crops of some varieties were an almost total failure from this cause.

Excellent control of *Rhizoctonia* brown patch and dollar spot on bent grasses [*Agrostis* spp.: *R.A.M.*, xiv, p. 449] was given by the application to the turf of calo-clor, a commercial preparation consisting of one-third mercuric chloride and two-thirds calomel [mercurous chloride] which also proved effective against pink patch (*Corticium fuciforme*) [ibid., xiii, p. 639], a cause of severe damage to golf greens.

A reduction in the assimilation of carbon dioxide by apple leaves was caused by the application of lime-sulphur sprays against scab (*Venturia inaequalis*). At high concentrations (1 in 8 and 1 in 15) complete burning of the foliage was induced under certain conditions [cf. ibid., xiii, pp. 34,

496, *et passim*]; at 1 in 40 less damage of this kind occurred after treatments at 8 a.m. and 5 and 8 p.m. than at 11 a.m. and 2 p.m. Very severe russeting of the fruit and partial defoliation was caused by Bordeaux 4–4–50 and 3–5–50, while some russeting was liable to follow the use of flotation sulphur and lime-sulphur.

Early and late blights of tomatoes [*Alternaria solani* and *Phytophthora infestans*: ibid., xiii, pp. 42, 195; xiv, p. 535, *et passim*] were controlled to the extent of 90 and 95 per cent., respectively, by fortnightly applications of 2–2–50 Bordeaux mixture throughout the growing season.

Early and late blights of celery [*Cercospora apii* and *Septoria apii*] were almost completely controlled by weekly treatments with 4–4–50 Bordeaux [ibid., x, p. 220].

Damping-off [?*Pythium* and *Rhizoctonia* spp.] was adequately combated in cabbage by seed treatment with trioxo, in pepper [*Capsicum annuum*], tomato, and beet with the same and formo-dust, in spinach with red oxide of copper [ibid., xiv, p. 582] and P–D–7, and in cucumber with red oxide of copper. The increases per acre in spring and autumn spinach from the red oxide of copper treatment were 570 and 596 bushels, respectively, the corresponding figures for P–D–7 being 245 and 518, respectively. Organic mercury compounds induced some stunting of lettuce [cf. ibid., xii, p. 264].

Tisdale (W. B.). **Plant pathology.**—*Rep. Fla agric. Exp. Sta. 1933–4*, pp. 70–80, 2 figs., [1935].

This report contains among many others the following items of phytopathological interest. Inoculation experiments by A. N. Brooks and R. E. Nolen showed that *Rhizoctonia* bud rot of strawberries is favoured by abundant soil moisture and high relative humidity, the presence of much organic matter in the top soil, and average daily mean temperatures under 75° F. The original isolate, which was practically identical morphologically with *Rhizoctonia* [*Corticium*] *solani*, was the only one capable of reproducing the disease, which readily attacks the crown but not the rhizome or roots.

Inoculations by A. N. Brooks of potted strawberry plants in the greenhouse showed that wilt (*Colletotrichum fragariae*) [*R.A.M.*, xii, p. 495] did not develop when the mean daily temperature averaged under 70°; field observations again showed the inadvisability of producing nursery strawberry plants on soil infected with this fungus.

Investigations by A. H. Eddins showed that stem rot (*Sclerotinia sclerotiorum*) [ibid., xi, pp. 652, 670] of white (Irish) potatoes was general throughout the Hastings area, where it sometimes reached epidemic proportions, infecting and killing prematurely up to 50 per cent. of the plants and causing a reduction in yield of 14 per cent. Comparisons of the susceptibility of different potato varieties to *C. solani*, as indicated by lesions on the stems 2 in. below the soil surface six weeks after planting, showed that, in three fields, the Katahdin variety had 0, 0·9, and 1·3 per cent. and the Spaulding Rose variety 5·2, 4·4, and 9·1 per cent. infection, respectively. In two potato-growing localities soil applications of sulphur, followed in the next season by others of finely ground agricultural limestone, practically eliminated bacterial wilt (*Bacterium*

solanacearum) [ibid., xiv, p. 85], and increased the yield of marketable tubers; sulphur or lime alone gave less satisfactory results. The increase in the soil acidity beyond P_H 4·57 brought about by the sulphur probably kills the bacterium, since the disease did not reappear when the soil was brought back to P_H 5·29 and 5·49 by the limestone treatment.

Maize leaf spot (*Diplodia macrospora*) [ibid., xiv, p. 355] usually occurs in low, moist situations, and R. K. Voorhees has demonstrated that infection develops at an average temperature of 85° and 80 per cent. relative humidity. Cross-inoculations showed that species of *Diplodia* from sweet potatoes, citrus, and cotton caused an ear rot of maize similar to that due to *D. frumenti*, the imperfect form of *Physalospora zeicola* [cf. ibid., xii, pp. 366, 552], while they also produced similar rots in oranges, grapefruit, sweet potatoes, cotton bolls, and watermelons.

Approximately ten new hosts have been added by A. S. Rhoads to the list of plants attacked by mushroom root rot (*Clitocybe tabescens*) [ibid., xiv, p. 86], making a total of 92 species now known to be attacked.

W. B. Tisdale and E. West found that a storage temperature of 48° inhibits decay of citrus fruits by *D. natalensis*, but permitted a small percentage of decay by *Phomopsis* [*Diaporthe*] *citri* [ibid., xiv, pp. 96, 453] in 60 days; no decay developed in grapefruit stored for 60 days at 42°, but infection increased rapidly when the fruit was removed to laboratory temperatures. Isolations from surface-sterilized parts of buttons and stems of tree-ripe Valencia oranges and Silver Cluster grapefruit showed that both fungi were already present in the buttons of some of the fruits when picked.

A preliminary survey by W. B. Tisdale showed that a bark disease of Tahiti limes chiefly associated with *Diplodia natalensis* and *Diaporthe citri* was present in all lime-growing areas. In the nursery the site of attack appeared to be determined by thorn punctures or other mechanical injuries; the part above the point of infection died. Perrine lemons were similarly affected. In the grove affected trees may die back from the point where they are cut off soon after transplanting, while after trees have been two to four years in the grove, infection occurs in the trunks, near the ground, and in the crotches of large branches, causing the death of the whole or part of the tree. Infection apparently occurs through cracks in the bark and mechanical injuries. *Diplodia natalensis* is usually present in infections of the trunks and large branches, and *Diaporthe citri* in those of small twigs and young trees.

Everglades Experiment Station.—*Rep. Fla agric. Exp. Sta. 1933–4*, pp. 86–112, 3 figs., 1 graph, [1935].

B. A. Bourne states that ring spot and eye spot of sugar-cane (*Helminthosporium ocellum*) [*R.A.M.*, xiv, p. 531] assumed serious proportions on large areas of commercially grown P.O.J. 2725 and other varieties in Florida. A covering of dead cane leaves provides a prolific source of inoculum during winter, when the temperatures approach the optimum for the development of the fungus (23·5° C.) and heavy dews remain on the leaves for exceptionally long periods. Isolation and inoculation experiments showed that the red rot of the leaf sheath prevalent among certain sugar-cane seedling progenies was due to *Colletotrichum falcatum* [ibid., xiv, p. 469]. The organism was grown in

culture and found to be identical with certain strains from diseased stalk tissue of P.O.J. 2714. Stalk red rot appeared in epidemic form in commercial plantings of this variety, about 30 per cent. loss occurring as rotted stalks. The heavily infected areas are rapidly being replaced with P.O.J. 2725 and other red rot-resistant varieties.

Observations by G. R. Townsend showed that potatoes succumbed to early blight (*Macrosporium* [*Alternaria*] *solani*) two weeks earlier in plots without potash than in those to which it had been supplied; the affected plants showed signs of potash deficiency before any blight lesions appeared. Cabbages grown in soil fertilized with potash are less, and those grown with phosphorus more, subject to downy mildew (*Peronospora parasitica*) than cabbages grown in unfertilized soil [cf. ibid., xiv, p. 546]. Beans [*Phaseolus vulgaris*] were defoliated by bacterial blights [*Bacterium medicaginis* var. *phaseolicola*, *Bact. phaseoli*, *Bact. phaseoli* var. *fuscans*, *Bact. flaccumfaciens*, *Bact. vignae* var. *leguminophila*, and *Bact. viridiflava*: ibid., xii, p. 71] earlier in plots deficient in potash than in those with normal soil.

SUIT (R. F.) & EARDLEY (E. A.). **Secondary tumor formation on herbaceous hosts induced by Pseudomonas tumefaciens Sm. and Town.** —*Sci. Agric.*, xv, 6, pp. 345–357, 2 pl., 1935. [French summary.]

When tomato, *Chrysanthemum frutescens*, and *Bryophyllum calycinum* plants were inoculated with *Pseudomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xiv, p. 289] by the broth-culture method (comprising insertion of the cut stem in broth culture for 4 hours, followed by removal of the leaves and setting in sterilized sand), the organism moved rapidly in the xylem, attaining in 4 hours a distance of at least 6 in. in tomato, 3 in. in *B. calycinum*, and 2 in. in *C. frutescens*. The movement down the stem reached 1 in. in 4 hours, the transpiration stream assisting the movement upwards [cf. ibid., vii, p. 431; ix, p. 512; x, p. 166]. The bacterium was isolated from apparently normal internodes of tomato plants 10 weeks after inoculation. Cuttings from tomato plants inoculated 9 weeks previously developed crown gall in 76 per cent. within 3 weeks, showing it is inadvisable to take cuttings from infected plants.

Further evidence of the movement of *Bact. tumefaciens* was afforded by the formation of secondary tumours on broth culture-inoculated tomato plants at a distance of 16 in. from the point of entry and on tobacco at 12 in. With needle inoculations the distance travelled was much less, fewer organisms being introduced. The secondary tumours developed at the cut petioles and also were extruded through the normal tissue.

Broth culture-inoculated tomato cuttings wounded by a cut on the fourth internode after one week, formed tumours at 94 per cent. of the wounds and those wounded after 3 weeks at 45 per cent.; with tobacco the percentage of wounds developing tumours ranged from 57 per cent. on cuttings wounded immediately after inoculation to 5 per cent. on those wounded 35 days after. These and other results indicate that if the bacterium is in the vascular system of a plant, wounds which injure this tissue will probably result in the formation of tumours.

Histological studies [which are described] showed that the movement

of the organism in the xylem vessels was influenced by the number and size of the vessels and the vascular anatomy of the stem.

Secondary tumours resulting from vascular infection may develop in three ways. Firstly, external tumours (resembling those from needle inoculation) arise from wounds which break the vessels and liberate the bacteria. Secondly, internal secondary tumours are formed associated with broken vessels of the protoxylem. Finally, extruding tumours are found on the stem surfaces; apparently the bacteria accumulate in a few of the vessels and induce the formation of a rootlet which forces its way through the cortex and becomes disorganized into a tumour as it appears on the stem surface.

SMITH (C. O.). **Crown gall on the Sequoia.**—*Phytopathology*, xxv, 4, pp. 439–440, 1 fig., 1935.

In May 1934, wounded *Sequoia gigantea* and *S. sempervirens* were inoculated at Riverside, California, with a culture of *Pseudomonas* [*Bacterium*] *tumefaciens* isolated from a peach seedling. One typical gall, some $\frac{3}{4}$ in. in diameter, was observed on *S. gigantea* in September, while a smaller one ($\frac{1}{8}$ in.) developed in October. Inoculations made later in the summer gave negative results, as also did those on *S. sempervirens*, apart from small enlargements with knot-like excrescences possibly representing incipient galls [cf. *R.A.M.*, xii, p. 405].

KADEN (O. F.). **Der Schnitt des Kakaobaumes und sein besonderer Zweck, die Krankheitsverhütung.** [The shaping of the Cacao tree and its particular object, the prevention of disease.]—*Tropenpflanzer*, xxxvii, 11, pp. 459–469, 4 figs., 7 diags., 1934.

The importance of achieving a correct shape in cacao trees is emphasized with special reference to the value of the 'crown' as a protection against desiccation and the resulting secondary diseases caused, e.g., by *Diplodia* [*Botryodiplodia*] *theobromae*, *Corticium salmonicolor*, and *Cephaleuros mycoidea* [*R.A.M.*, xiii, p. 222], and directions are given for this. Care must be taken to secure evenness of the top even at the cost of sacrificing fruiting branches; the latter should also be lopped when weighed down to the ground by their fruits, which are otherwise liable to infection by *Phytophthora faberi* [*P. palmivora*: cf. next abstract]. Drastic pruning should be carried out annually, but the actual renovation of the crown need not be undertaken more often than every two to three years and should on no account involve the removal of more than one-fifth of the growth. Strict attention must be paid to the cleansing of the trees from excrescences of all kinds, of which the most important are the witches' brooms produced by *Marasmius perniciosus* [ibid., xiv, p. 430]. The spurious witches' brooms associated with *Colletotrichum luxificum* [ibid., xiii, p. 221] are primarily due to adverse climatic factors and are merely unsightly without being dangerous.

The Central and South American practice of growing cacao trees in groups to form large bushes cannot be recommended for the West Indies and still less for West Africa, where it is believed to have been a contributory factor in the 'morte subita' disease [loc. cit.].

The standard shape commonly encountered in West Africa, where the trees are so densely planted that they attain an excessive height

without forming proper crowns, has various drawbacks, including the stimulation of infection by *P. palmivora* through the moisture reserves abundantly present under such conditions.

ALICBUSAN (L. A.). **Beneficial effects on diseased Cacao trees of removing infected parts and disinfecting the wounds.**—*Philipp. Agric.*, xxiii, 10, pp. 891–904, 1 pl., 3 figs., 1935.

The most injurious diseases of cacao in the Philippines are stated to be black rot of the pods, canker of the twigs and branches, and blight of the seedlings, all caused by *Phytophthora palmivora* [*R.A.M.*, xiii, p. 813]. Inoculations with the species of *Diplodia*, *Fusarium*, and *Gloeosporium* frequently associated with the cacao pod rot failed, and these fungi are considered to be saprophytes. In the seedlings, infection by *P. palmivora* starts from the tip and gradually spreads downwards, killing the young and tender leaves and causing the infected parts of the shoot to dry up and harden. In a series of experiments on the control of the disease, the best results were given by pruning off the infected material [cf. preceding abstract], cutting out the cankers, and painting the wounds with Bordeaux paste or lead paint; some improvement in the condition of the trees was effected by pruning alone and by treatment of the wounds with coal tar, formalin or copper sulphate solution, or sapolin paint.

HUMPHREY (H. B.). **Cereal-rust parasitism: its relation to water economy, yield, and quality of the host plant.**—*Trans. roy. Soc. Canada*, Sect. V (Biol. Sci.), Ser. III, xxviii, pp. 153–164, 1934. [Received April, 1935.]

This is a compilation of some important papers describing experiments conducted by the Division of Cereal Crops and Diseases, United States Department of Agriculture, co-operating with the Indiana, Iowa, and Kansas State Agricultural Experiment Stations, on the relationship of cereal rust (*Puccinia* spp.) parasitism to the water economy, yield, and quality of the hosts. The subject is treated under the following headings: recent experiments on the effects of leaf rust of wheat (*P. triticina*) and crown rust of oats (*P. coronata*) [*P. lolii*] on their hosts; effect of leaf rust of wheat on yield of straw, grain, and roots; effect of leaf rust of wheat on the chemical composition of the grain, leaves, and culms; effects of crown rust of oats on yield of straw, grain, and roots; and effect of rust infection on the water economy of the host plant. Reference to most of the recent work has been made from time to time in this *Review*.

PAL (B. P.). **Wheat rusts from the viewpoint of plant breeding.**—*Agric. Live-Stk India*, v, 2, pp. 139–144, 1935.

The importance of breeding wheat varieties resistant to the black, yellow, and brown rusts (*Puccinia graminis tritici*), [*P. glumarum*, and *P. triticina*] is discussed in relation to some outstanding recent researches on this subject, and with particular reference to K. C. Mehta's studies on its possibilities in India [*R.A.M.*, xiii, p. 499].

VASEY (A. J.), BALDWIN (J. G.), & DOERY (A. C.). **Stem rust at Werribee. Its incidence during 1934.**—*J. Dep. Agric. Vict.*, xxxiii, 4, pp. 185–187, 1 graph, 1935.

After pointing out that at the State Research Farm, Werribee, Victoria, wheat stem rust (*Puccinia graminis tritici*) during the last twenty years has only twice been of economic importance, viz., in 1916 and 1934, the authors state that in October and November of the latter year the local rainfall was 227 per cent. above the average. It was only during the first week of November, however, that high maximum temperature combined with high humidity prevailed, and it was during this period that the main attack of rust occurred.

The effect of the rust on Free Gallipoli wheat was to reduce the average yield per ear and the average weight of 1,000 grains from 0·755 and 41·3 gm. to 0·616 and 32·5 gm., respectively; the average number of grains per ear remained normal, but the crop was thicker than usual, and the yield per acre was 25·4 as against an average of 24·9 bushels for the previous eight years. Had the weight of grain been equal to that of 1933, which might reasonably have been expected since the rainfall was adequate, the yield would have amounted to 38·4 bushels per acre, and the loss in yield due to rust, therefore, is calculated as at least 13 bushels per acre. There was even a greater reduction in yield in the varieties flowering during the period of maximum infection.

LEHMANN (E.) & KUMMER (H.). **Schwarzrostbekämpfung durch Berberitzenausrottung in Württemberg.** [Black rust control through Barberry eradication in Württemberg.]—*Kranke Pflanze*, xii, 4, pp. 55–58, 1935.

Notes are given on the organization of the barberry eradication campaign for the control of cereal black rust [*Puccinia graminis*] in Württemberg [*R.A.M.*, xiv, p. 88] and on the various methods of extermination employed. It is estimated that between 40,000 and 50,000 bushes have been uprooted to date in the rural districts of Alb and Oberland.

TASUGI (H.). **On the physiology of Typhula graminum, Karst.**—*J. agric. Exp. Sta., Tokyo*, ii, 4, pp. 443–458, 2 pl., 1 fig., 1935. [Japanese, with English summary.]

The writer, pursuing his studies on the snow rot of cereals in Japan caused by *Typhula graminum* [*R.A.M.*, ix, p. 709; xiii, p. 223], summarizes the results concerning the growth of the fungus in relation to the choice of media, temperature, and hydrogen-ion concentration. Agar media containing decoctions of Gramineae and potato agar were the most favourable of the substrata used. The optimum temperature for development ranged from 8° to 15° C., with a minimum and maximum below 5° and at 22° to 23°, respectively. Growth was most profuse at P_H 7. From a consideration of the relationship between light and sclerotial production it may be tentatively concluded that under snow, which permits only the light of the longer wave-lengths to reach the soil, the sclerotia produce, instead of normal fructifications, creeping mycelia that invade the young host and cause snow rot.

Greaney (F. J.) & Machacek (J. E.). **Studies on the control of root-rot disease of cereals caused by Fusarium culmorum (W. G. Sm.) Sacc. and Helminthosporium sativum P., K., and B. II. Pathogenicity of Helminthosporium sativum as influenced by Cephalothecium roseum Corda in greenhouse pot tests.**—*Sci. Agric.*, xv, 6, pp. 377–386, 2 figs., 1935. [French summary.]

Greenhouse experiments [which are described in detail and discussed] carried out at Winnipeg showed that the pathogenicity to wheat of a fast-growing strain of *Helminthosporium sativum* was suppressed by the antagonistic action in the soil of *Cephalothecium* [*Trichothecium*] *roseum* [*R.A.M.*, xii, p. 729; xiii, p. 758].

Preliminary physiological studies demonstrated that the staling products released by *T. roseum* in liquid media markedly inhibited the germination and germ-tube growth of the spores of *H. sativum*, the toxicity of the substances produced by *T. roseum* probably being the chief factor in suppressing the pathogenicity of *H. sativum.*

Sprague (R.). **Wojnowicia graminis as a very weak, secondary parasite of winter cereal crops.**—*Phytopathology*, xxv, 4, pp. 405–415, 2 figs., 1935.

In Oregon and Washington *Wojnowicia graminis* [*R.A.M.*, v, p. 223] has been isolated from the following autumn-sown grains and grasses in the field: wheat (including *Triticum dicoccum*, *T. monococcum*, and *T. spelta*), barley, rye, oats, *Agropyron inerme*, *A. riparium*, *Bromus tectorum*, *Koeleria cristata*, and *Poa sandbergii*. *Cercosporella herpotrichoides* [ibid., xiv, p. 230] was consistently associated with *W. graminis* on the grasses, all of which were found in a restricted area of Spokane County, Washington. The results [which are discussed and tabulated] of six years' greenhouse inoculation experiments at Corvallis, Oregon, on wheat, barley, rye, and several grasses indicated that, in general, *W. graminis* causes little or no damage to its hosts, an outcome confirmed by field trials with wheat [cf. ibid., xiii, p. 569]. There was, however some evidence of rather more injury to rye and barley, the yield of the latter being reduced as a result of inoculation with an Australian strain of the fungus [ibid., xiv, p. 425].

The genus *Wojnowicia* Sacc. (Syll. Fung., xviii, p. 367, 1906) differs from *Hendersonia* Berk. mainly in the presence of blunt setae on the pycnidia, and the writer questions the need for the original separation of the two. However, since the name *W. graminis* has become established, its retention pending further studies seems to be indicated, though it is considered probable that most of the species of both genera recorded on Gramineae, including *H. herpotricha* Sacc. (the pycnidial stage of *Ophiobolus herpotrichus*) [ibid., xiv, p. 352], *H. graminis* McAlp., and *H. secalina* Died., are strains of the fungus known as *W. graminis*. The latter has been found to consist of a complex of physiologic forms differing slightly among themselves in rate and type of growth on potato-dextrose agar and wheat grain cultures, as well as in pigmentation and crystalline precipitates on the former medium. Most of the cultures of this fungus found associated with *C. herpotrichoides* are of almost identical aspect except for the coloration induced in the

substratum (bright lemon, orange, or rosaceous), but at least four distinct strains were isolated from grasses and from wheat in the semi-arid parts of the Columbia Basin free from *C. herpotrichoides*. The Australian strains studied resembled those isolated from wheat in Oregon.

BOCKMANN (H.). **Über die betriebswirtschaftlichen Hintergründe der Fusskrankheiten des Weizens.** [On the underlying causes of Wheat foot rots inherent in methods of farm practice.]—*Dtsch. landw. Pr.*, lxii, 13, p. 155, 1935.

Present-day farming practice in Schleswig-Holstein, in relation to the steady extension of the area under wheat during the period from 1927 to 1933, is believed to be largely responsible for the persistence of lodging (*Cercosporella herpotrichoides*) in the local crops, from which blackleg [*Ophiobolus graminis*], the other main type of root rot, is stated to have been virtually eliminated. The cultural factors involved in the etiology of lodging and the means for its prevention are briefly discussed in connexion with the writer's personal observations [*R.A.M.*, xiii, p. 569; xiv, p. 351, and next abstract].

MEYER-BAHLBURG & BINDFEIL. **Betriebswirtschaftliche Hintergründe der Weizenfusskrankheiten?** [Are methods of farm practice the underlying causes of Wheat foot rots?]—*Dtsch. landw. Pr.*, lxii, 15, p. 184, 1935.

The first-named writer disputes Bockmann's view [see preceding abstract] that the occurrence of wheat foot rots [especially *Cercosporella herpotrichoides*] in Schleswig-Holstein is bound up with modern trends in farm practice. The simplest and most radical, but also the dearest, method of combating these diseases is to 'starve out' the parasites by the interposition of black fallow in the crop rotation, but Schaffnit's recommendations for the deep ploughing-under of the stubble of the preceding crop [*R.A.M.*, ix, p. 587] have been abundantly justified in local practice [cf. also ibid., xii, p. 157; xiv, p. 230]. Where this precaution is strictly observed the area under wheat may safely be extended (by as much as 50 per cent. in a case under personal observation) without disorganizing the existing rotation system.

The second-named writer very briefly considers the relation of undue luxuriance in autumn-sown wheat to the subsequent development of *C. herpotrichoides*.

GUYOT (A. L.). **Observations sur quelques maladies fusariennes des céréales en France.** [Notes on some *Fusarium* diseases of cereals in France.]—*Rev. Path. vég.*, xxi, 4, pp. 143–186, 1 pl., 10 figs., 1934. [Received July, 1935.]

The results of cultural and morphological studies [full details of which are given] carried out during several years by the author indicate that species of *Fusarium* are frequently associated with cereal (oats, barley, and wheat) foot and root rots in France, especially when due to *Ophiobolus graminis* [*R.A.M.*, xiv, p. 351], and that lodging and 'échaudage' [scalding] which are typical of such rots, are also produced by these species. They are also frequently found in cases of disease unassociated with the typical mycelial plates of *O. graminis* and there seems little

doubt that they are responsible for a number of cases of cereal disease. All the *Fusarium* forms which have been isolated from affected cereals in France are referable either to *F. herbarum* [ibid., xii, p. 278] and its varieties *graminum* (Cda) Wr. (=*F. graminum* Cda), and *avenaceum* (Fr.) Wr. (=*F. avenaceum* (Fr.) Sacc.=*F. subulatum* App. & Wr.) or to *F. culmorum* [ibid., xiii, p. 758] (=*F. rubiginosum* App. & Wr.). In the last-named species there appeared to exist strains, some of which corresponded more closely in their morphological details to *Fusisporium culmorum* as described from wheat ears by W. G. Smith in 1884, while the others stood closer to *Fusarium rubiginosum* described in 1910 by Appel and Wollenweber from mummified potatoes. Observations further showed that these *Fusarium* forms are responsible for a generalized browning of the basal internode of cereals, differing from that associated with ordinary foot rot in the absence of superficial black mycelial mats, as well as in the shape and appearance of the lesions.

Churchward (J. G.). **A note on the occurrence in New South Wales of black chaff of Wheat caused by Bacterium translucens var. undulosum S.J. and R.**—*J. roy. Soc. N.S.W.*, lxviii, pp. 104–106, 1935.

Wheat black chaff (*Bacterium translucens* var. *undulosum*) [*R.A.M.*, xiii, p. 428], which has probably been present for several years in New Sourh Wales, was definitely identified in three localities there in 1934. Cross-inoculations showed that the causal organism was able to infect wheat and rye. Federation wheat, when grown under glasshouse conditions, was less susceptible than Hope. Preliminary tests indicated that the hot water treatment for loose smut [*Ustilago tritici*] also reduces infection by black chaff.

Chaudhuri (H.). **A bacterial disease of Wheat in the Punjab.**—*Proc. Indian Acad. Sci.*, i, 10, pp. 579–585, 1 pl., 1935.

After referring to earlier investigations into earcockle of wheat [*R.A.M.*, vi, p. 216; xii, p. 749] and the associated bacterial disease, the author describes inoculation experiments carried out in the Punjab which demonstrated conclusively that, contrary to the view generally held hitherto, the disease can be caused by *Pseudomonas tritici* alone, the presence of the nematode *Tylenchus scandens* [*Anguillulina tritici*] being unnecessary. Earcockle infection always takes place in the soil, usually when the seeds germinate, whereas in the bacterial disease infection may occur at any stage of plant growth, though late infection causes very little distortion.

Lowig (E.). **Ueber den Einfluss der Kalisalze, insbesondere ihrer Anionen, sowie der Kieselsäure und des Stickstoffs auf die Mehltauresistenz von Getreide und Futterpflanzen.** [On the influence of potash salts, especially of their anions, as well as of silicic acid and nitrogen on the resistance to mildew of cereals and fodder plants.]—*Landw. Jb.*, lxxxi, 2, pp. 273–335, 15 figs., 4 graphs, 1935.

This is an amplified, fully tabulated account of the writer's studies on the preventive action of potash salts and silicic acid against cereal mildew (*Erysiphe graminis*) [*R.A.M.*, xii, p. 620; cf. also xiv, p. 26].

The experiments have since been extended to the mildew [*E. graminis*] of the grasses *Phalaris arundinacea*, *Dactylis glomerata*, and *Festuca pratensis*, and to that [*E. polygoni*] of crimson clover (*Trifolium incarnatum*), with confirmatory results. White spotting is a typical feature of potash shortage in oats, fodder grasses, and clover. A direct proportion was established between nitrogen content and mildew in the test plants [ibid., vi, p. 156]. It is evident from the experimental results that potash acts as a regulator for the absorption of nutriment by the plant; possibly its absence modifies the permeability relations of the protoplasm and transforms the osmotic functions into diffusion processes.

Morwood (R. B.). **Report of cereal smut experiments, 1934.**—*Qd agric. J.*, xliii, 4, pp. 337–342, 1935.

In comparative tests with various seed treatments against cereal smuts in Queensland, the best control of wheat bunt (*Tilletia foetens* and *T. caries*) was given by commercial copper carbonates, Victoria standard copper carbonate, abavit B, and Cooper's mercurial A and B, which reduced infection from about 40 per cent. in the controls to under 2, 1·7, 0·3, 0, and 2 per cent., respectively.

Against barley covered smut (*Ustilago hordei*) the best method of applying formalin was sprinkling, which caused less injury to germination than other formalin treatments; in two experiments formalin sprinkle gave 0 and 0·3 per cent. infection, respectively, the figures for ceresan (2 oz. per bushel) and Cooper's A and B (mercury dusts not yet available commercially, applied at the rate of 3 oz. per bushel) being 2·3 and 0, 2 and 0·3, and 2 and 0 per cent., respectively. The results obtained with the dusts did not warrant increasing the dose to 3 oz. per bushel but any reduction below 2 oz. is considered inadvisable.

Formalin (1:240, 10 minutes' soaking), sublimatoform (1 part of mercuric chloride and 2½ parts of formalin per 1,000 parts water), abavit B, and ceresan reduced loose and covered smut of oats (*U. levis* [*U. kolleri*] and *U. avenae*, respectively) from an average of 32 per cent. in the controls to 0, 0, 0·5, and 0·5 per cent., respectively.

Excellent control of *U. bromivora* [*R.A.M.*, xii, p. 294] on prairie-grass [*Bromus unioloides*] was given by abavit B and ceresan (3 oz. per 20 lb. of seed) which reduced infection from 83·5 per cent. in the controls to 0·1 and 0 per cent., respectively; formalin (10 minutes' immersion) reduced infection to 0·2 per cent., but adversely affected germination.

Petit (A.). **Observations sur le traitement des semences des céréales. Toxicité du soufre précipité pour le charbon couvert de l'Orge.** [Notes on the treatment of cereal seed-grain. Toxicity of precipitated sulphur to covered smut of Barley.]—*Rev. Path. vég.*, xxii, 1, pp. 57–59, 1935.

The author states that in 1934 a plot of barley raised in Tunis from seed-grain artificially inoculated with covered smut [*Ustilago hordei*] spores and dusted with hydrophilous precipitated sulphur at the rate of 350 gm. per quintal [50 kg.] remained completely free from the disease [*R.A.M.*, xiv, p. 159], while a control plot from seed similarly inoculated but not dusted, exhibited a slight attack by the smut. The treatment

should be further tested, since the cost of the precipitated sulphur is about half that of cupric salts used for cereal seed disinfection.

VEARS (C. K.) & MACINDOE (S. L.). **Oat smut. The reactions of varieties to the disease.**—*Agric. Gaz. N.S.W.*, xlvi, 4, pp. 187–190, 1 pl., 1 fig., 1935.

The average reduction in yield from smut [*Ustilago avenae* and *U. kolleri*] on the widely grown White Tartarian oats variety in New South Wales is stated probably to amount to 10 per cent. *U. avenae* is the more prevalent of the two smuts in the State. Brief directions for the control of the disease are given. Tests showed the following varieties to be immune: Baxter, Bimbi, Black Mesdag, Burt's Early, Estramadura Grey, Fergusson Navarro, Kandos, Victoria, Frazier, Fulghum, and Lampton, of which the last three are commercial or promising new varieties. Lampton is of considerable importance; a Departmental oat of the breeding Abruzzes×Victory×Reed, it is highly resistant to stem [black] rust [*Puccinia graminis avenae*], is very strongly strawed, and produces good grain; it is later maturing than Algerian and coarser in the straw, but does not recover so well after grazing.

POPP (W.) & HANNA (W. F.). **Studies on the physiology of the Oat smuts.** —*Sci. Agric.*, xv, 6, pp. 424–434, 3 figs., 1935. [French summary.]

In this paper the authors give a full account of their investigations into the relationship between the loose and covered smuts of oats (*Ustilago avenae* and *U. levis* [*U. kolleri*]), a preliminary report on which has already been noticed [*R.A.M.*, x, p. 304]. The following points are new. Proof of the dominance of the factor for spore echinulation was obtained by back-crossing cultures of the F_1 hybrid (*U. avenae*×*U. kolleri*) with cultures of *U. avenae* and *U. kolleri*.

The appearance of smutted heads, whether covered or loose, was not a consistently reliable indication of the kind of chlamydospores they contained, though plants inoculated with cultures bearing the factor for echinulate spores produced a higher proportion of heads of the loose type than did those inoculated with cultures bearing the factor for smooth spores. There was some evidence that environmental factors also influence the type of head produced.

Segregation for sex and cultural characters occurred at the first or second division of the chlamydospore nucleus.

No significant difference was found in the ability of *U. avenae*, *U. kolleri*, the F_1 and F_2 generations of *U. avenae*× *U. kolleri*, and the F_1 of (*U. avenae* × *U. kolleri*) × *U. kolleri* spores to germinate, but sporidia of the F_1 of *U. avenae* × *U. kolleri* spores, as compared with those of the others, were much less capable of growth on artificial media.

REED (G. M.). **Reports on research for 1934. Plant pathology.**—*Rep. Brooklyn bot. Gdn, 1934* (*Brooklyn bot. Gdn Rec.*, xxiv, 2), pp. 50–58, 1935.

A summary is given of the results of experiments conducted during 1934 with the second, third, fourth, and fifth generations of the oat hybrids undergoing investigation for the inheritance of their reaction to loose and covered smuts [*Ustilago avenae* and *U. kolleri: R.A.M.*, xii,

p. 562; xiv, p. 436, and next abstract], a full account of which is stated to be in preparation. Definite evidence was obtained from extensive observations on smut collections from red oat varieties that the Fulghum race of *U. avenae* is quite distinct from that on Red Rustproof, both being readily separable from many other highly specialized strains of the fungus. Particular interest attaches to the strain of *U. kolleri* on Fulghum on account of its capacity to attack the ordinarily highly resistant Black Mesdag. Analytical data on 235 chlamydospore and conidial cultures from 11 races of *U. avenae* kept under observation for periods from 2 months to 4 years revealed in several cases continuous definite variations in colour and topography extending through one to five culture generations. Similar results were obtained in a somewhat smaller proportion of the 244 cultures from 6 strains of *U. kolleri* examined for the same purpose.

Some 50 per cent. of the Feterita sorghum plants inoculated with covered smut [*Sphacelotheca sorghi*: ibid., xiv, p. 504] failed to produce normal heads and bore little or no grain; in certain instances the smut balls of the fungus were found on the diseased flower buds, indicating that the mycelium had developed in the plant to the stage of spore formation. Under normal field conditions Feterita is resistant to *S. sorghi* [ibid., xiii, p. 227], but genetically its response is evidently quite different from that of Milo which, as in previous seasons, remained completely immune. Notes (to be amplified in a subsequent publication) are given on the results of experiments on five generations of sorghum hybrids in connexion with studies on the inheritance of reaction to *S. sorghi*.

REED (G. M.). **Inheritance of resistance to loose smut in hybrids of Fulghum and Black Mesdag Oats.**—*Bull. Torrey bot. Cl.*, lxii, 4, pp. 177–186, 1 graph, 1935.

The results [which are tabulated] of the author's studies on the inheritance of resistance to loose smut (*Ustilago avenae*) in four hybrids of Fulghum (susceptible) and Black Mesdag (resistant) oats [see preceding abstract] indicated that, as judged from the behaviour of the F_2 and F_3 generations, resistance to the particular race of loose smut used (collected from Fulghum) is dominant and that segregation occurs on the basis of a three to one ratio [cf. *R.A.M.*, xiii, p. 761]. In a few cases, completely resistant F_3 progenies of F_2 populations subjected to the inoculation test gave rise to F_4 families in which a smutted plant was observed, but all of the F_4 progenies grown from resistant F_3 families were resistant. Very susceptible F_3 progenies (descended from non-inoculated F_2 populations), on the other hand, produced F_4 families showing great variation in the amount of smut (from 7·1 to 100 per cent.), but most of them contained over 50 per cent. of smutted plants. These results are considered to indicate that resistant selections may be easily secured through a series of generations.

SANFORD (G. B.). **Colletotrichum graminicolum (Ces.) Wils. as a parasite of the stem and root tissues of Avena sativa.**—*Sci. Agric.*, xv, 6, pp. 370–376, 2 pl., 1935. [French summary.]

From oats growing in the vicinity of Edmonton, Alberta, and affected

with the severe root rot recently reported [*R.A.M.*, xiii, p. 224] the author isolated a species of *Colletotrichum* identified by S. F. Ashby as *C. graminicolum* (*C. cereale* Manns) [ibid., ix, p. 22], the fungus being obtained from the young seminal roots, the seedling axis below the crown, the crown itself, and from sclerotioid bodies produced on parts in the field.

Pot-culture tests showed that the fungus severely attacked the seminal roots and injured the first internode, these effects corresponding to the symptoms observed in the field. As soon as the adventitious roots were established the plants tended to revive, and many became normal under the test conditions. Faint beginnings of acervuli were noted about 40 days after seeding. Recovery of plants in the field also coincided with the development of adventitious roots, which as a rule, are not deeply penetrated by the fungus.

Histological examination of infected material showed that the cortex of the young seminal roots and that of the stem between the scutellar and crown nodes appeared to be the parts most severely affected. Except for a transient compatibility between host and pathogen, there was complete early collapse of the cells of the cortex and endodermis, with disintegration of the invading hyphae. Some resistance was offered by the stereome and the elements of the vascular bundles, but all were penetrated though the cells remained intact and the hyphae did not disintegrate.

The isolate used in the tests did not attack wheat, barley, or flax, though as the fungus was obtained from wheat and oats stubble, it is considered that races of *C. graminicolum* specific to the two last-named hosts may exist.

RADEMACHER (B.). **Die Dörrfleckenkrankheit.** [The grey speck disease.] —*Flugbl. biol. Reichsanst., Berl.* 136, 4 pp., 2 figs., 1935.

Popular notes are given on the ecology, host range, symptoms, and control of grey speck [*R.A.M.*, xiv, p. 122] of oats and other crops in Germany. The disease may be combated directly by soil treatment with finely ground manganese sulphate (50 to 150 kg. per hect.) and indirectly by the persistent application of physiologically acid fertilizers to release the available manganese, as well as by the cultivation of resistant varieties of oats, only the black types of which are suitable for seriously affected soils.

RADEMACHER (B.). **Die Heidemoorkrankheit (Urbarmachungskrankheit).** [The heath bog disease (reclamation disease).]—*Flugbl. biol. Reichsanst., Berl.* 137, 4 pp., 1 pl., 1935.

Notes are given in popular terms on the ecology, host range, symptoms, and control (direct and indirect, i.e. by cultural measures) of the reclamation disease of cereal and other crops in Germany [*R.A.M.*, xii, p. 86; xiv, p. 160]. Equally effective with copper sulphate (1·5 to 3 per cent., 800 l. per hect.) for soil treatment against this disease, but more expensive, are the copper-containing preparations used in charlock [*Brassica sinapis*] control, namely, germanit (Fahlberg-List A. G., Magdeburg-Südost), hedrinol (Silesia, Ida- und Marienhütte, Post Saarau, Kreis Schweidnitz), obranit (Chem. Fabriken Oker und Braunschweig A. G., Oker, Harz), and raphanit (also supplied in dust form)

[ibid., x, pp. 489, 704] from Schering-Kahlbaum A. G., Abt. Schädlingsbekämpfung, Berlin N. 65, Müllerstr. 170, 171.

BARNETTE (R. M.) & WARNER (J. D.). **A response of chlorotic Corn plants to the application of zinc sulfate to the soil.**—*Soil Sci.*, xxxix, 2, pp. 145–159, 2 pl., 1935.

'White bud', a serious disease of maize in Florida, characterized by a white to very pale yellow coloration of the unfolding buds of seedlings and by a chlorotic streaking and spotting of the older leaves [cf. *R.A.M.*, vii, p. 740; x, p. 686; xii, p. 746], was shown by experiments [the results of which are tabulated and discussed] on the Whatley's Prolific variety to be curable by the application to the soil of 'chemically pure' zinc sulphate ($ZnSO_4.7H_2O$), a mixed inorganic fertilizer, and alkaline peat at the rates of 20 and 400 lb. and 5 tons per acre, respectively. Good results were also given by stable manure and leaf mould (4 and $2\frac{1}{2}$ tons, respectively), while chicken manure (2 tons) and alkaline peat effected a considerable improvement in the diseased condition without, however, entirely counteracting the symptoms.

HIURA (M.). **Mycological and pathological studies on the downy mildew of Italian Millet.**—*Res. Bull. Gifu Coll. Agric.* 35, pp. 121–283, 6 pl., 1935.

Some of the data obtained by the writer in his extensive investigations on the mycological and pathological aspects of downy mildew (*Sclerospora graminicola*) on *Setaria italica* in Japan have already been presented in preliminary reports [*R.A.M.*, viii, pp. 441, 716; ix, pp. 105, 774; x, p. 23; cf. also xiii, p. 629]. In this monographic study the results of the whole investigation are collected, tabulated, and exhaustively discussed.

Two types of infection are differentiated, systemic and local, the chlorotic areas on the leaves due to the former usually being large and laciniate while those associated with the latter are restricted or spotted. Conidial dimensions increase with the growth of the host and the advance of the season, the spores becoming slightly more elongated as the temperature rises. A reduction in the size of the conidia and conidiophores accompanies a drop in atmospheric humidity. The conidia produced on seedlings are smaller than those on well-grown plants, while those on metamorphosed leafy structures are usually very large. The temperature range for conidial production in *S. graminicola* is from 10° to 25° C. with an optimum at 17° to 18°, the period required for their formation being shortest at 18° to 20°. In cool, cloudy weather they are often produced in the daytime. The minimum atmospheric humidity for conidial development averages between 80 and 85 per cent. at 18°. The period required for conidial germination varies with different temperatures, ranging from 30 minutes at 20° to 25° to 5 hours at 6° to 7°; the minimum, optimum, and maximum temperatures for the process are 5° to 7°, 18°, and 30° to 32°, respectively. The conidia of *S. graminicola* are remarkably short-lived, dying shortly after the evaporation of the moisture from the fructification layer. Their viability may be prolonged, however, under humid conditions.

Oospore germination appears to be most profuse between 20° and 25°. The percentage of germinating oospores was found to increase in over-

wintered material, indicating the existence of a dormant period. Profuse infection was found to occur in soil inoculated with oospores three years previously, but after five years their viability seemed to be lost. In general, the oospores of the fungus from *Setaria italica* are somewhat larger than those formed on other hosts.

Seedling infection may take place through the mesocotyl (inoculations at the base of which produced the mildew symptoms after 15 hours' incubation) as well as through the coleoptile and primary root.

A six-page bibliography is appended.

TASUGI (H.). **The relation of the environmental factors and the treatment of oospores to the infection by oospores of Sclerospora graminicola (Sacc.) Schroet. (Studies on Nipponese Peronosporales IV.)**—*J. agric. Exp. Sta., Tokyo*, ii, 4, pp. 459–480, 1935. [Japanese, with English summary.]

Using physiologic form IV of *Sclerospora graminicola* from *Setaria italica* [see preceding abstract], the writer carried out experiments to determine the response of the oospores to environmental factors and to treatment by heat and chemicals.

Infection by oospores was shown to be most active at a soil temperature of 20° to 21° C., the minimum and maximum for the process being about 12° to 13° and 30°, respectively. Seed sown during April was the most liable to infection, the incidence of which declined progressively during May, falling to 4 per cent. by the 28th of that month and ceasing entirely by the end of June. The highest percentage of infection was recorded at a soil reaction of P_H 5·20, above which there was a gradual decrease to only 15·96 per cent. at P_H 8·14. The disease was most severe in soils with a moisture content (based on the water-holding capacity) of 80 per cent., the range for comparatively serious damage, however, extending from 50 to 100 per cent.; at 40 per cent. the oospores of the fungus were unable to germinate.

Hot water treatment at 50° or 55° gave excellent control, no infection by the oospores resulting after one hour's exposure at the former or after 10 minutes' at the latter temperature. Mercuric chloride at 0·01 per cent. was effective when the steeping lasted for 2 hours or more, while at 0·05 per cent. it proved toxic to the oospores in 30 minutes. At 0·1 and 0·25 per cent. formaldehyde exerted a lethal action on the oospores in 4 hours and one hour, respectively. Even at 0·5 per cent. copper sulphate was not completely efficacious though in 4 hours a considerable reduction of infection was obtained.

ELZE (D. L.). **Some experiments on the combined effect of Diplodia and green mould inoculations on Oranges.**—Reprinted from *Hadar*, 9 pp., 1934. [Received June, 1935.]

The results [which are discussed and tabulated] of experiments at Rehovoth, Palestine, on the effect on oranges of combined inoculations with *Diplodia natalensis* and *Penicillium digitatum* [*R.A.M.*, viii, p.236] showed that the virulence and rapidity of development of the former are slightly and those of the latter greatly increased by the mixture. In fact, when *P. digitatum* is present on an orange in an inactive condition, subsequent inoculation with *D. natalensis* may stimulate it into vigorous

parasitism. It is further probable, though not yet conclusively proved, that oranges from *Diplodia*-infected trees will be more liable to invasion by *P. digitatum* than healthy ones.

Citrus Experiment Station.—*Rep. Fla agric. Exp. Sta. 1933–34*, pp. 81–85, [1935].

In extensive experiments by G. D. Ruehle on the control of citrus scab [*Sporotrichum citri*: *R.A.M.*, xiii, p. 26] in different parts of Florida, one application of a Bordeaux-oil spray reduced the percentage of blemished fruit from 97 to under 10 per cent. A dormant Bordeaux-oil spray followed by two and three applications of a sulphur spray gave only slightly better control; a second Bordeaux mixture spray at petal fall reduced infection to 5 per cent. The results obtained indicate that one thorough, timely application of Bordeaux-oil spray is sufficient to give commercial control of the disease.

KLOTZ (L. J.) & FAWCETT (H. S.). **Rind breakdown of Navel Orange.**—*Calif. Citrogr.*, xx, 5, p. 124, 1 fig., 1935.

Attention is drawn to a destructive breakdown of the rind of Washington Navel oranges that is stated to have caused considerable loss during the current harvest in California, where the mild winter favoured early ripening of the fruit with the consequence that the rind was abnormally weak and susceptible to injury of various kinds. The disorder appears to be a non-parasitic breakdown following cold, wet weather with north winds, and is probably induced by an internal and external liberation of rind oil, which leads to the development of a Mars yellow to Brussels brown (Ridgway) discoloration of the tissues injured by the toxic oil. Water spot [*R.A.M.*, xiv, p. 234] and rot, quite a distinct condition, may also occur on the oranges suffering from rind breakdown, a study of the factors promoting which were made with a view to control. Evidence was obtained in the packing-house that the use of ethylene gas [ibid., xii, p. 20] accentuates the breakdown and deepens the brown colour. The injury was simulated by bumping freshly-picked oranges and by the external application and hypodermic injection of rind oil. The injured areas of the rind are liable to infection by blue and green moulds [*Penicillium italicum* and *P. digitatum*], while the surface is often covered with the appressoria of the tear stain fungus [*Colletotrichum gloeosporioides*].

KADEN (O. F.). **Kulturmassnahmen als Bekämpfungsmittel der Stammfäule von Ölpalmen.** [Cultural measures as means of combating the stem rot of Oil palms.]—*Tropenpflanzer*, xxxviii, 4, pp. 140–144, 2 figs., 1935.

The writer's observations in West Africa have convinced him that *Fomes lucidus* and *F. applanatus* [*Ganoderma lucidum* and *G. applanatum*: *R.A.M.*, xi, p. 105; xii, p. 80; xiii, p. 604] only occur on oil palms weakened by some extraneous agency, the true cause of stem rot being either nutritional disturbances or senescence. A simple remedy for the disease consists in the heaping-up of the soil over the roots protruding from the ground, supplemented by the removal of superfluous leaves. Where infection has actually taken place the diseased

areas must be excised, the wound cauterized to prevent fresh attacks, and earth piled up round the trunk. These measures strengthen the tree and induce the formation of new roots; they are stated to have saved a number of valuable plantations in the regions under the author's supervision—Angola, the Congo, and St. Thomas and Princes Islands.

BAIN (F. M.). **'Bronze leaf wilt' of the Coconut Palm.**—*Proc. agric. Soc. Trin. Tob.*, xxxv, 12, pp. 507–521, 1934. [Received June, 1935.]

While the results up to date of the investigations, briefly mentioned in a previous communication, of the bronze leaf wilt of coco-nuts in Trinidad [*R.A.M.*, xiii, p. 289] do not warrant a definite conclusion as to the causes of the trouble, the balance of evidence indicates that environmental factors leading to a rapid water deficit in the plant tissue at a definite period are apparently of major importance. Certain types of soil are seemingly more favourable than others to the development of the disease, and further planting of coco-nuts on such soils is not considered to be advisable. Of several remedial treatments that were tested, recovery of four diseased trees resulted from watering in conjunction with applications of potassium and ammonium sulphates.

RUSSO (G.). **Il raggrinzimento o arricciamento del Cotone nella Somalia Italiana.** [Cotton leaf curl or crinkle in Italian Somaliland.]—*Agricoltura colon.*, xxix, 2, pp. 78–95; 3, pp. 133–143; 4, pp. 188–199, 12 figs., 2 graphs, 1935.

After briefly describing the symptoms of cotton leaf curl or crinkle as it occurs in Italian Somaliland, the author gives a full account of his investigations (carried out in the area concerned) into the nature and cause of the disease. He concludes that it is due, locally at least, to physiological factors set up by the high concentration of soluble alkaline salts in the soil resulting from the fact that the numerous deep cracks which are allowed to develop in the ground favour water evaporation by capillary action. The soil is very compact and sub-alkaline, and the irrigation water contains rather a large amount of chlorides, especially in the wet season. Further factors are the hot, dry, windy season in July and August, the rapid and considerable increase in the transpiration rate brought about by wind and sun, and the drop in temperature during the second half of July and the first half of August.

The author's experiments, in which insects taken from naturally diseased cotton in the field were fed on healthy plants with negative results, did not indicate that the form of leaf curl found locally belongs to the virus group of diseases. It is not found, even in the presence of insects, in fields where precautions are taken against the evaporation of soil moisture.

PICKETT (A. D.). **Some observations on an outbreak of the two-striped grasshopper (Melanoplus bivittatus Say) in Nova Scotia.**—*Canad. Ent.*, lxvii, 2, pp. 24–27, 1935. [Abs. in *Rev. appl. Ent.*, A, xxiii, 6, pp. 285–286, 1935.]

Under the very humid conditions prevailing in the Grand Pré district of Nova Scotia in July, 1932, a heavy infestation of the two-striped grasshopper (*Melanoplus bivittatus*) was reduced by 50 to 90 per cent. in

certain localities by *Empusa grylli* [*R.A.M.*, xiv, p. 497], introduced on infected individuals collected from the Avon River area where the fungus was observed to be present. In 1933 the insects were again decimated by the same fungus, only 20 to 25 per cent. of the originally abundant swarm being left by 15th August.

CARTER (W.). **The symbionts of Pseudococcus brevipes (Ckl.).**—*Ann. ent. Soc. Amer.*, xxviii, 1, pp. 60–64, 4 pl., 1935.

The symbionts of *Pseudococcus brevipes*, the insect vector of green spotting of pineapple leaves in Hawaii [*R.A.M.*, xiv, pp. 216, 379], were found on examination in Buchner's laboratory at Breslau to be enclosed within a light brown (occasionally pale creamy) mycetome in a mass of tracheae. They are of two kinds, one of which, the 'common symbiont', has been consistently detected in all the insects examined. It is characterized by extreme polymorphism, some cells being formed by budding after the manner of yeasts, others showing excessive vacuolation, while spherical forms (apparently representing the 'infection stage') develop in large numbers as the insect approaches maturity. The second, rod-shaped type, occurring only under certain nutritional conditions of the host, and apparently conditioning the oral secretions of the latter, is clearly analogous to a bacterium and is a constant feature of the mealy bugs producing green spotting of pineapple leaves in their feeding, being absent, on the other hand, from non-spotting colonies. Congenital transmission of the symbionts is effected by a process similar to that known in *P. citri*, except that in *P. brevipes*, aggregates of minute 'infection stages' pass from the adult mycetome to the developing egg.

GREGORY (P. H.). **The dermatophytes.**—*Biol. Rev.*, x, pp. 208–233, 1935.

This is a general survey of the literature (supplemented by a three-page bibliography) on the dermatophytes [cf. *R.A.M.*, viii, p. 445], which are discussed under the headings of the parasitic and saprophytic phases, affinities with other fungi, and classification. In respect of the last-named, the various new systems proposed of recent years are considered to be no improvement on Sabouraud's, which is widely known, extensively used, and should, in the writer's opinion, be retained with a few adjustments to bring it into line with the rules of botanical nomenclature.

HRUSZEK (H.). **Recherches sur la cause et la nature de la dégénérescence duveteuse des champignons des teignes.** [Studies on the cause and nature of the downy degeneration of ringworm fungi.]—*Ann. Parasit. hum. comp.*, xiii, 2, pp. 165–172, 1 pl., 2 figs., 1935.

The author cultured *Achorion gypseum* [*R.A.M.*, xiii, p. 768] on different natural media and on the usual synthetic media with or without the addition of certain substances, and also under varying environmental conditions. The results indicated that the fungus, in dependence on these nutritional and other factors, exhibits three very different types of growth, namely, one (hitherto considered as typical) characterized by a chalky macroscopic appearance and the presence of very numerous spindles of the *Microsporon* type; a second, considered by him to be atypical, of the pleomorphic downy type; and the third with a

faviform appearance and corresponding microscopic structure. The last mentioned usually develops under the effect of high temperature (37° C.), or when the fungus is cultured on certain natural media, e.g., apple slices. It is suggested that the usual synthetic media are too rich in nutrients for certain fungi, such as *A. gypseum*, and favour from the start the development of the degenerating downy type of growth.

BRANCHINI (B.). **Di una rara forma di dermatomicosi nel cane.** [On a rare form of dermatomycosis in the dog.]—Reprinted from *Atti Ist. bot. Univ. Pavia*, Ser. IV, vi, 53 pp., 23 figs. (1 col.), 1935. [English and Latin summaries.]

A dermatomycosis of the dog observed by the author in 1932 was ascertained to be due to a very rare fungus, *Achorion caninum*, described by Costantin & Sabrazès in 1893 as *Oospora canina*. Considerable details are given on the morphology and cultural characters of the fungus, of the influence of environment on it, and on experimental inoculations which reproduced the condition.

CONANT (N. F.). **Synonymie de Microsporum canis, Bodin 1902 et de M. equinum Nicolas et Lacomme 1906.** [Synonymy of *Microsporum canis* Bodin, 1902, and of *M. equinum* Nicolas & Lacomme, 1906.]—*Ann. Parasit. hum. comp.*, xiii, 2, pp. 161–164, 1935.

The author states that the name *Microsporum* [*Microsporon*] *felineum* [*R.A.M.*, xiii, p. 577] is untenable since Fox and Blaxall (1896–98), to whom it is generally attributed, never used the specific name and only referred to the fungus as the 'cat ringworm', 'the cat group of ringworm fungi', and the like. The name was first used in 1907 by Sabouraud in an explanatory legend to his photographs. In 1930 Langeron and Milochevitch showed that *M. felineum* is identical with *M. lanosum*, reducing the latter to the rank of a synonym, and referred the fungus to the genus *Sabouraudites* [ibid., x, p. 243; cf. also, xii, p. 23]. On the other hand in 1906 Nicolas and Lacomme showed that *M. lanosum* is identical with the dog ringworm fungus which in 1902 had been named *M. canis* by Bodin. In the author's opinion, therefore, the fungus should be known, for reasons of priority, as *M. canis*, with *M. lanosum* Sabouraud 1907, and *M. felineum* as synonyms.

The authority for the binomial *M. equinum* [ibid., xiii, p. 303] should be Nicolas & Lacomme 1906, since these authors were the first to use it for the fungus which was described by Bodin in 1898 as *M. audouini* var. *equinum*.

GOUGEROT (H.), COHEN (R.), CARTEAUD (A.), & DUCHÉ (J.). **Endomycose ulcéro-végétante du nez due à Endomyces albicans. Lupus vulgaire associé : hybride de mycose et de tuberculose.** [Ulcero-vegetative endomycosis of the nose due to *Endomyces albicans*. Common lupus associated: a combination of mycosis and tuberculosis.]—*Arch. derm.-syph.*, vi, 3, pp. 378–383, 2 figs., 1934.

Full clinical details are given of a case, examined and treated by the writers, of combined mycosis and tubercular lupus, manifested as a nasal ulceration in a 17-year-old girl. The causal organism was identified as *Endomyces albicans* [*R.A.M.*, xii, p. 288].

UHRY (P.). **Un cas d'endomycose sous-cutanée chez un diabétique.** [A case of subcutaneous endomycosis in a diabetic.]—*Arch. derm.-syph.*, vi, 4, pp. 478–481, 1 fig., 1934.

Endomyces albicans [see preceding abstract] was isolated from subcutaneous lesions developing as a sequel to pneumonia in a male patient suffering from diabetes. Positive results were given by inoculations on mice and guinea-pigs.

CIFERRI (R.) & REDAELLI (P.). **Prima contribuzione allo studio delle cosidette blastomicosi americane. Gli Endomyces del gruppo dermatitidis-capsulatus, agenti della dermatite verrucosa micosica di Gilchrist.** [First contribution to the study of the so-called American blastomycoses. The *Endomyces* of the *dermatitidis-capsulatus* group, agents of Gilchrist's mycotic verrucose dermatitis.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV, vi, pp. 55–105, 12 figs., 1935. [Latin and English summaries.]

This is an expanded account of the writers' studies on *Gilchristia dermatitidis* (*Endomyces dermatitidis*, *E. capsulatus* and its var. *isabellinus*, and *Blastomyces gilchristi*), a preliminary notice embodying the salient features of which has already appeared [*R.A.M.*, xiv, p. 99].

NINNI (C.) & FITTIPALDI (C.). **Contributo alla conoscenza della biologia e delle proprietà patogene delle Mycotoruleae.** [A contribution to the knowledge of the biology and of the pathogenic property of the Mycotoruleae.]—*G. Batt. Immun.*, xiv, 4, pp. 941–974, 4 figs., 1935. [French, English, and German summaries.]

It is apparent from the authors' studies [the results of which are fully discussed and the experimental data tabulated] that the Mycotoruleae, including *Candida* spp. and *Mycotorula zeylanoides*, are readily distinguishable from the Torulopsideae [*R.A.M.*, xiv, p. 306], e.g., *Torulopsis* spp. and *Cryptococcus hominis* [ibid., xiv, p. 100], and from *Saccharomyces cerevisiae* [ibid., xiv, p. 383] both by their different morphological aspect in cultures prepared from peritoneal exudations of inoculated guinea-pigs and by their divergent types of growth on carbolized Sabouraud's agar at appropriate concentrations. A description is given of the experimental infection of guinea-pigs with the Mycotoruleae and of the specific granuloma consistently obtained by simulating the conditions giving rise to the disease in man. A study was further made of the allergic reactions, sufficiently specific, developing in guinea-pigs in response to inoculation with *Candida* spp., as well as of the striking phenomena of hyper-receptivity connected with and superposed on the well-marked but feeble manifestations of resistance [ibid., xiv, p. 307].

MOORE (M.). **A morphological and physiological study of two species of Posadasia : P. capsulata (Darling) Moore and P. pyriformis Moore.**—*Ann. Mo. bot. Gdn*, xxii, 2, pp. 335–360, 4 pl., 1935.

Continuing his studies on *Posadasia capsulata* and *P. pyriformis* [*R.A.M.*, xiii, p. 637; cf. also xiv, p. 446], the writer (using cultures that had already formed mycelium and presented no evidence of yeast-like cells) found that the fungi, which occur in the host as small cells 1 to 4 μ

in diameter, develop on an artificial substratum an aerial and submerged mycelium, giving rise to intercalary, lateral, or terminal, sessile or pedicellate chlamydospores, occurring singly or in groups and measuring 3 to 10 μ in diameter (or when enlarged at the hyphal tip 6 to 20 by 3 to 10 μ); sessile or pedicellate, spherical or piriform conidia, 2 to 8 μ in diameter; and a racquet mycelium. Tuberculate asci, which are spherical (5 to 25 μ) in both species and in *P. pyriformis* only also piriform (12 to 26 by 6 to 12 μ, usually 22 by 10 μ), develop from globose or clavate cells, 5 to 18 μ in diameter, in the apparent absence of any sexual contact. Each ascus contains a number of small, spherical spores which are set free by the rupture of the ascus wall to germinate and form a mycelium, though under favourable conditions the ascus itself may germinate with few or several germ-tubes. *P. capsulata* also differs from *P. pyriformis* in its relatively smaller size, scantier growth, and white to pale Isabella colour compared with Isabella to pale cinnamon in *P. pyriformis*.

The transference of *Cryptococcus farcinimosus* and *C. muris* to *Histoplasma* (=*Posadasia*) by Redaelli and Ciferri [ibid., xiv, p. 446] is not accepted by the author.

MOORE (M.). **Head infection caused by a new Hemispora: H. coremiformis.**—*Ann. Mo. bot. Gdn.*, xxii, 2, pp. 317–334, 2 pl., 1935.

A full account is given of studies of a new species of *Hemispora*, *H. coremiformis*, isolated from a human head infection in Costa Rica. The fungus exists in a yeast-like form in the host and assumes a filamentous character on artificial media, the colonies on which are stellate, vermiculate, coremiform, or cerebriform, greyish-white, creamy-buff, light cinnamon, or pale Isabella. Coremia, composed of cells 5 to 21 by 3 to 6 μ, are formed on most solid media but not on liquid substrata. The mycelium consists of arthrosporoid cells, elongated forms, and short structures occurring either as simple or branched, septate hyphae, 2 to 4 μ in diameter, terminating in clavate, spherical, or ampulliform cells (hemispores) measuring 12 to 18 by 7 to 15 μ. The conidia measure 4 to 6 μ in diameter and the spherical and piriform blastospores 4 to 6 μ and 6 by 4 μ, respectively. The spherical intercalary chlamydospores measure 6 to 10 μ in diameter and the ovoid 12 to 14 by 8 to 9 μ. The echinulate spores produced by the apical cells of mature hyphae are 3 to 6 (generally 5) μ in diameter.

The author does not accept Ciferri's and Redaelli's view that the genus *Sporendonema* supersedes *Hemispora* [*R.A.M.*, xiii, p. 700], as there is insufficient similarity in the characters of the former genus to justify the change.

DESSY (G.). **La chimiothérapie des mycoses. VIème Partie. Torulopsis-mycose. Ière Communication. Expériences 'in vitro'.** [The chemotherapy of mycoses. Sixth part. *Torulopsis*-mycosis. First communication. Experiments *in vitro*.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 3, pp. 79–91, 1935.

Continuing his investigations [*R.A.M.*, xiii, p. 238], the author conducted experiments *in vitro* to ascertain the inhibiting power on growth in culture and the fungicidal effectiveness shown towards *Torulopsis cabrini*, *T. bergami*, *Geotrichoides krusei*, *Endomyces cortese*, *Mycotorula*

(*Mycotoruloides*) *aegyptiaca* Cif. et Red., isolated from human interdigital lesions in Cairo, *Saccharomyces gracilis caverniculae* (Redaelli) Stelling-Dekker, and *Candida pinoyi* [ibid., xiv, p. 308], by 51 colouring agents [ibid., xiv, p. 105] and 22 metallic salts.

The best results were given by methyl violet, malachite green, gentian violet, and crystal violet among the colouring agents, while of the metallic salts the most active were mercuric chloride and mercuric cyanide.

Kingery (L. B.), Williams (R.), & Woodward (G.). **Further studies in fungicides: comparative evaluation of phenol derivatives by modified laboratory procedure.**—*Arch. Derm. Syph., N.Y.*, xxxi, 4, pp. 452–460, 1 fig., 1 diag., 1935.

Of the 38 phenol derivatives investigated as to their toxicity towards *Monilia* [*Candida*] *tropicalis*, n-hexylresorcinol, 3,5-dibutyl phenol, and n-hexyl ether of resorcinol revealed the highest fungicidal values, while these in turn were surpassed by iodine [*R.A.M.*, xiv, p. 105]. Fungicidal activity appears to depend, not only on the constituents of a given side chain, but also on its position on the benzene nucleus. In a series of tests in which *C. tropicalis* was exposed to contact with proteins (human vesicle fluid, blood serum, and hide dust) so as to simulate its natural habitat, marked discrepancies were apparent between the fungicidal values and the clinical efficacy of some well-known therapeutic agents, such as salicylic and benzoic acids, suggesting that the recognized beneficial action of these drugs may be due rather to some specific reaction of the tissues to their application than to any effect on the pathogen. At high concentrations sodium hypochlorite [ibid., xii, p. 509] retained its toxic properties throughout the experiments.

Sartory (A.), Sartory (R.), Meyer (J.), & Baumli (H.). **Quelques champignons inférieurs destructeurs du papier.** [Some lower fungi destructive to paper.]—*Papier*, xxxviii, 1, pp. 43–44, 47–48, 51–52, 1935.

An expanded account, containing full morphological and physiological details of the organisms involved, is given of the writers' experimental studies at Strasbourg University on five paper-destroying fungi, a preliminary note on which has already appeared [*R.A.M.*, xiii, p. 770]. The species concerned were determined as *Cladosporium herbarum* var. *cellulosae* n. var., *Fusarium coeruleum* var. *cellulosae* n. var., *Aspergillus fumigatus* var. *cellulosae* n. var., *Actinomyces cellulosae* Krainsky, and *Monilia cellulosophaga* n. sp. The last-named is characterized by thick-walled, septate hyphae, 1·6 to 2·4 μ in width, bearing lemon-shaped macro- and microconidia, the former measuring in culture 3·9 by 2·4 μ and the latter 2 by 1·4 μ. The fungus grows best at 37° C., coagulating milk, liquefying gelatine, and forming gas from maltose, saccharose, glucose, and galactose.

Rossi (F.) & Rozzi (G.). **Su la decomposizione della cellulosa per opera dei funghi.** [On cellulose decomposition through fungal activity.]—*Boll. Ist. agr., Pisa*, x, 112, pp. 271–275, 1934. [Received July, 1935.]

Of the 30 fungi—common occupants of soil, air, and various natural

substrata—tested under controlled conditions at Pisa for their cellulose-destroying capacities on a silica gel-blotting-paper medium at 24° C., only two species of *Fusarium*, one of *Aspergillus* [cf. preceding abstract], and *Stachybotrys lobulata* gave positive results.

Galloway (L. D.). **The moisture requirements of mould fungi, with special reference to mildew in textiles.**—*J. Text. Inst., Manchr*, xxvi, 4, pp. T123–T129, 2 pl., 1935.

In confirmation of observations made in technical practice, the addition of deliquescents, such as glycerol and magnesium chloride, to the size mixings and finishing pastes used in textile manufacture has been found to stimulate mould growth (directly and not by reason of the increased moisture uptake), while spore germination, e.g., in *Aspergillus niger* and *A. herbariorum* var. *major*, increased *pari passu* with rising concentrations of the latter deliquescent. The minimum relative humidity requirements of some common moulds [cf. *R.A.M.*, ix, p. 784; xiii, p. 702] were found to range from 75 to 95 per cent., among the less exacting organisms being *A. glaucus* (group), *A. candidus*, *A. versicolor* [ibid., vii, p. 580], and *Penicillium* spp., any of which are therefore liable to cause trouble under moderate storage conditions.

Wollenweber (H. W.). **Alpenveilchen- (Zyklamen-) Welke, eine Krankheit pilzlicher Natur.** [Alpine Violet (Cyclamen) wilt, a disease of fungal nature.]—*NachrBl. dtsch. PflSchDienst*, xv, 4, pp. 38–39, 2 figs., 1935.

Some 10 per cent. of the potted *Cyclamen persicum* plants in frames and forcing houses in the Berlin district were destroyed in the late summer of 1934 by a wilt disease involving the leaves, inflorescences, and vascular bundles. From the last-named *Fusarium oxysporum* var. *aurantiacum* [*R.A.M.*, xi, p. 306] was isolated and inoculated with positive results into healthy plants through wounds in the bulb tips. *Cylindrocarpon radicicola* [ibid., xii, p. 224] occurred, presumably as a secondary invader, in the bulb of a wilted plant and was also found associated with a soft rot of the pedicels and bulbs in company with *F. solani*, *Nectria rubi* [ibid., vi, pp. 212, 529, 565], and *N. septomyxa*. Further investigations are necessary to determine the exact relations of these organisms to the disease under observation, while the part played by a *Gloeosporium* of the *fructigenum* group on the leaves is also obscure. The *Fusarium* infection, the optimum temperature for which lies round about 28° C., was presumably favoured by the exceptionally hot, dry summer.

Green (D. E.). **Leaf spot of Daphne mezereum caused by Marssonina daphnes (Desm. et Rob.) Magn.**—*J. R. hort. Soc.*, lx, 4, pp. 156–158, 2 figs., 1935.

This is an expanded account of the writer's investigations in 1934 on the leaf disease of *Daphne mezereum* in England caused by *Marssonina daphnes*, a note on which has already been published [*R.A.M.*, xiv, p. 173].

Wallace (E. R.). **Experiments on fungus diseases.**—*Holland County Council (Lincolnshire) Bulb Res. Sub-Ctte, Expts with Bulbs Rept., 1933*, pp. 37–47, 1934. [Abs. in *Chem. Abstr.*, xxix, 11, pp. 3763–3764, 1935.]

In experiments in the control of tulip 'fire' (*Botrytis tulipae*) [*R.A.M.*, xiv, pp. 366, 513], the bulbs treated for 1 hour either with 1 part formalin in 150 parts water, for 8 hours in bouisol (1:150) [ibid., xiv, p. 213], or twice for 5 minutes each in steriform (1:50) showed very good skins on cleaning. Various other treatments caused injury to the bulbs.

Lüstner (G.). **Ein Oidium auf Calanchoe.** [An *Oidium* on *Calanchoë*.]—*NachrBl. dtsch. PflSchDienst*, xv, 4, p. 41, 1935.

In February, 1935, the writer received from Darmstadt *Calanchoë* [*Kalanchoë* Adans.] leaves, their upper sides strewn with the circular or irregular, greyish-white patches of a mildew, beneath which the epidermis was necrosed and readily detachable. In severe cases the mesophyll was also dead and desiccated. Only one conidium was borne on the mostly tricellular conidiophores. The perfect stage could not be traced, so that for the present it is suggested the fungus be known as *Oidium calanchoeae* [no diagnosis being given]. This is stated to be the first appearance of the disease in the Darmstadt cultures.

Weiss (F.). **Aid of collaborators requested in Azalea flower spot survey.**—*Plant Dis. Reptr*, xix, 3, pp. 21–24, 1935. [Mimeographed.]

Further details are given of the Indian azalea [*Rhododendron indicum*] flower spot in the gardens bordering the Ashley and Cooper Rivers for 20 to 30 miles above Charleston, South Carolina, to which attention has already been drawn in a preliminary note [*R.A.M.*, xiv, p. 365]. The first conspicuous symptoms are small, irregular spots, white on coloured and brown on white flowers, either restricted to the two lower corollary lobes or scattered over the whole flower. Under warm, moist conditions the entire inflorescence may be involved in one or two days, at which stage the flowers collapse but remain on the twigs. The surface of the lesion appears viscid and the affected tissue is so completely disorganized as to rupture almost at a touch. In cool, dry weather the progress of the infection may be arrested, the spots developing well-marked margins and translucent centres, with a dirty white or pale brown surface. After five or six days, in cases of early, rapid attacks, the fungus forms one or more black, cupulate sclerotia in the blighted corolla; when infection is delayed abscission of the corolla may occur normally, the sclerotia developing later in the fallen flowers. Mid-season varieties, e.g., Formosa, Phoenicia, and Brilliant, are the most liable to infection, optimum conditions for which prevail during their blooming period. Field observations point to the implication of insects in the transmission of the disease, the study of which would be greatly facilitated by the help of collaborators in the collection of field material with observations thereon.

McWhorter (F. P.). **Some diseases of ornamentals in Oregon.**—*Plant Dis. Reptr*, xix, 2, p. 18, 1935. [Mimeographed.]

In 1934 many acres of bulbous iris varieties, notably Wedgwood, The First, and David Bless, were defoliated by *Heterosporium gracile*, the

Didymellina stage [*D. macrospora*: *R.A.M.*, xi, p. 559] of which has not been observed on these varieties in nature, though inoculations on bulbous plants with isolations from typical German iris leaf spot showed the organism to be identical on both. At present this is the most important disease of iris in Oregon, mosaic having been largely eliminated.

Some 20 per cent. of the Calla lily (*Zantedeschia ethiopica*) plants in a Portland greenhouse are reported to be suffering from a mosaic presenting every characteristic of a typical virus disease.

A canker of holly [*Ilex aquifolia*], which has been troublesome since 1929 and in 1933 killed over 1,000 trees in a nursery near Astoria, was found to be associated with *Phomopsis crustosa* (Sacc.) Bomm. & Rouss., while *Diaporthe* (?) *eres* [ibid., xiii, p. 270] was also present in some specimens. The canker is of the girdling type and appears on the green twigs as bright brown spots that soon darken and become depressed.

Alexopoulos (C. J.). **Gloeosporium leaf spot, a serious disease of Orchids.**—*Phytopathology*, xxv, 4, pp. 435–437, 1 fig., 1935.

A hitherto undetermined species of *Gloeosporium* has been found to cause a severe foliar infection of *Pholidota imbricata* in the University of Illinois glasshouses. Numerous sunken, reddish-brown, marginate spots, finally coalescing, often destroy the whole leaf. Infection may originate on either leaf surface. On reaching a diameter of some 5 mm., the lesions generally resemble a wide crater with a sunken centre and raised margin. The acervuli of the fungus develop in profusion on the shrivelled leaves, and preliminary inoculations with the spores on apple resulted in the characteristic symptoms of bitter rot (*Glomerella cingulata*) [*R.A.M.*, xiv, p. 40]. However, as perithecia have not been found, exact identification is impossible at present.

Bennett (F. T.). **Corticium disease of turf.**—*J. Bd Greenkeep. Res.*, iv, 12, pp. 32–39, 3 pl., 3 graphs, 1935.

A semi-popular account is given of the 'brown patch' disease of turf caused by *Corticium fuciforme* [see above, p. 562 and next abstract], which in England is stated to be most severe on fescue grasses [*Festuca* spp.] though also attacking others, e.g., *Agrostis tenuis*, *Poa annua*, *Lolium perenne*, *Holcus mollis*, *Bromus mollis*, and *Agropyron repens*. The fungus is most prevalent in the south on chalky or sandy soils but occurs also throughout the midland and northern counties and in Scotland.

The life-history of *C. fuciforme* is briefly described. The maximum growth is made at a mean summer temperature of 70° F., but its development, though retarded, is not inhibited by extremes, either of heat or cold. Growth was further found to occur through a reaction range of P_H 3·5 to 7·5.

The most promising results in the control of brown patch were obtained by the treatment of the turf with a proprietary mercurial powder (1 in 15,000), very closely followed by malachite green and Bordeaux mixture [cf. *R.A.M.*, xiii, p. 242 and next abstract].

Bennett (F. T.). **Fungus diseases of bowling and golf greens.**—*Agric. Progr.*, xii, pp. 164–169, 1935.

A popular account is given of British turf diseases caused by fungi, with special reference to *Fusarium nivale* [*Calonectria graminicola*] and *Corticium fuciforme* [see preceding abstract]. An affinity between the latter and *Geotrichum roseum* has been suspected but the fungi appear to be distinct, though similar in vegetative habit. The present extensive use of sea-marsh turf, consisting almost exclusively of the susceptible *Agrostis* sp. and red fescue (*Festuca rubra* var. *glaucescens*), is thought to be largely responsible for the widespread occurrence of disease, and in this connexion a brief discussion is given on the general management of greens, with special reference to the adjustment of the P_H values of the turf by appropriate treatments.

Malachite green has been found to be four or five times more toxic to *C. fuciforme* and ten times more so to *Calonectria graminicola* than mercuric chloride, and absolute control of both fungi is stated to have been secured by weekly applications of the former substance (1 in 10,000) in a dilute Bordeaux mixture.

Buchholtz (W. F.). **Relation of soil acidity to a seedling disease of Alfalfa on three Iowa soils.**—*Phytopathology*, xxv, 4, pp. 421–425, 1 fig., 1935.

Some of the information in this paper on the *Pythium* disease of lucerne on acid Iowa soils has already been noticed from another source [*R.A.M.*, xiv, p. 241], but the following additional points are of interest. Sugar beets, red and sweet clover [*Trifolium pratense* and *Melilotus alba*], alsike [*T. hybridum*], and flax have also been found affected by the same disorder in the field. Besides the beneficial effects of steaming and formaldehyde treatment of the soil, already noted in the case of lucerne and alsike, good results on a limited scale are reported from the dusting of sugar beet seed with hydrated lime and by liberal applications of limestone to a lucerne planting.

Horne (A. S.). **On the numerical distribution of micro-organisms in the atmosphere.**—*Proc. roy. Soc.*, Ser. B, cxvii, 803, pp. 154–174, 1935.

The author gives some details of the standardization suggested by him of the method of previous workers of exposing plates for catching air-borne micro-organisms, which was applied in 1930–1 in five separate centres in England and Northern Ireland for the study of the numerical distribution of the organisms in the air, principally in orchards selected to show variation in environmental conditions, and at different times of the year. The results of statistical analysis [considerable details of which are given] showed that the density of the air-borne organisms is dependent on the class of the micro-organisms, the day on which the observations were made, the time of day, position in the orchard, and rain. Data obtained from four different localities indicated that the actual numbers of micro-organisms counted, the degree of heterogeneity of populations, and the time of year when numbers decline to the minimum found in winter also depend on the locality, apparently in relationship to the standards of cultivation attained by the local fruit-growers.

GÜLL (A.). **Verwendungszweck, Wirkung und Kosten einiger Spritzmittel des Obstbaues.** [Purpose, action, and costs of some orchard sprays.]—*Obst- u. Gemüseb.*, lxxxi, 4, pp. 59–60, 1935.

Details are given of the uses, application, effects, and costs of some standard insecticides and fungicides commonly employed in German orchards. A winter treatment with lime-sulphur is stated to be less effective than one with fruit tree carbolineum, and the cost of the former (M. 3.50 for the requisite 20 l. per 100 l. water) is also unduly high. Lime-sulphur (2 per cent.) is indispensable, however, for the summer schedule against scab (*Fusicladium*) [of apples, pears, and cherries: *Venturia inaequalis*, *V. pirina*, and *V. cerasi*, respectively: *R.A.M.*, xiv, p. 317] and mildew of certain fruits. The cost of Bordeaux mixture (2 per cent.) is about M. 0·50 per 100 l.; for the post-blossom application a concentration of 0·5 to 1 per cent. is sufficient.

WINKELMANN (A.) & HOLZ (W.). **Beiträge zur Biologie und Bekämpfung des Apfelschorfes (Fusicladium dendriticum [Wallr.] Fckl).** [Contributions to the biology and control of Apple scab (*Fusicladium dendriticum* [Wallr.] Fckl).]—*Zbl. Bakt.*, Abt. 2, xcii, 1–3, pp. 47–61, 1 graph, 1935.

In 1934 the ascospores of apple scab (*Fusicladium dendriticum*) [*Venturia inaequalis*] were first detected in the air of apple orchards [by means of a spore trap, containing a lanolined slide, exposed among the trees] in three localities near Berlin on 10th April, on which date also the first discharge was observed on overwintered leaves [see next abstract]. The second dispersion lasted from 20th to 30th April, while the third began in two places early in May and terminated on the 20th; in the remaining locality it did not occur until the third week of the month. Infection resulting from the second dispersion took place just before blossoming. Conidia were not detected on the foliage until after 10th May and apparently were chiefly concerned with the purely local spread of the disease. The maximum benefit from spraying was derived at the time of the main (second) dispersion, when the effects of Bordeaux mixture were observed to be stronger and more permanent than the action of lime-sulphur.

WIESMANN (R.). **Untersuchungen über die Bedeutung der Ascosporen (Wintersporen) und der Konidien an den schorfigen Trieben für die Entstehung der Primärinfektionen des Apfelschorfpilzes Fusicladium dendriticum.** [Investigations on the significance of the ascospores (winter spores) and conidia on the scabby shoots in the origination of the primary infections of the Apple scab fungus *Fusicladium dendriticum*.]—*Landw. Jb. Schweiz*, xlix, 2, pp. 147–175, 4 figs., 5 graphs, 1935. [French summary.]

A detailed account is given of the writer's studies at Wädenswil, Switzerland, during 1932–3 on the relation of the ascospores and conidia on scabby apple shoots to the origination of primary infections by *Venturia inaequalis* [*R.A.M.*, xii, p. 178 and preceding abstract].

By means of a 'Condor' suction pump specially adapted for the purpose, 'filtration' of the orchard air was effected daily for 74 days (7th April to 20th June) in 1932, and for 56 days (8th April to 2nd June) in 1933, during which periods ascospores were found to be present in the

atmosphere. In the former year they were most numerous (maximum number caught per l. of filtered air 11) between 23rd April and 11th May, and in 1933 from 25th April to 10th May (maximum number per l., 1·37). In addition to the ascospores of *V. inaequalis*, those of pear scab (*V. pirina*) and white leaf spot (*Mycosphaerella sentina*) [ibid., xiii, p. 219] were found in abundance in the filters. The early and profuse development of the apple scab ascospores was correlated with pre-blossom primary infections on Gravensteins. The course of ascospore production in *V. pirina* ran parallel with that of *V. inaequalis* in both years, while the observations suggested that ascospores are the chief, if not the sole originators of white leaf spot in the early part of the season. The value of pre-blossom fungicidal treatment with a view to checking primary infection is discussed in relation to Swiss conditions.

Apple scab conidia were found to be liberated in appreciable numbers just before and at the onset of blossoming but their maximum liberation was deferred until the flowering was well under way. As with the ascospores, rain is a pre-requisite condition for conidial dissemination.

The destruction of dead leaves in the autumn was found to be very effective in reducing by some four-fifths the number of ascospores of the scab fungi in the air of the orchard. It was further shown that perithecial formation can be prevented by a late autumn application of 1 per cent. helion [ibid., xiii, p. 11] or 8 per cent. fruit tree carbolineum [ibid., xiv, p. 371], while the latter alone destroys the perithecia in the dead leaves on the ground in the early spring. Dormant treatments are ineffectual, however, against the conidia, owing to the protected situation of the mycelium below the swollen bark of the diseased shoots.

CHEAL (W. F.). **Apple scab spraying experiments in the Wisbech area: the times of application—III.**—*J. Minist. Agric.*, xli, 12, pp. 1190–1194, 1 pl., 1935.

The results of the 1934 spraying experiments in the Wisbech area of Cambridgeshire, which were carried out on the same lines as in the preceding year [*R.A.M.*, xiii, p. 311], definitely showed the advisability of spraying at the 'green flower' stage for the control of apple scab [*Venturia inaequalis*] in that area on Cox's Orange Pippin, even if the young lateral wood has been heavily pruned away and the trees have been well treated in the previous year. This application was also shown to be exceedingly valuable on Bramley's Seedling in 1934, when the spring rains were very favourable for the development of scab, since the two plots which received it gave 87·6 and 85 per cent. clean fruit, respectively, as compared with 48·85 per cent. from the plot in which it was omitted, and 28·6 per cent. from the unsprayed plot. The results further tended to confirm the advisability of this early application on Emneth Early [loc. cit.], although it was not as important on this variety as on the other two.

HAMILTON (J. M.). **Studies on Apple scab and spray materials for its control in the Hudson Valley.**—*Tech. Bull. N.Y. St. agric. Exp. Sta.* 227, 56 pp., 18 graphs, 1935.

Investigations, conducted over a period of five years, into the seasonal development and control of apple scab (*Venturia inaequalis*) in the Hudson Valley [*R.A.M.*, xi, p. 788] showed that ascospore discharge may

extend from the middle of April to the last week in June. The frequency and duration of the showers in the early part of the season, and the temperatures prevailing in the later part are the chief factors determining the length of time during which danger from primary infection persists. Pre- and post-blossom sprays were sometimes equally valuable. Every year most of the severe primary infection occurred during May. The pink, calyx, 10-day, and codling-moth (mid-June) sprays were the most important but the value of any individual spray depended on the incidence of infection the previous year and on the frequency and duration of rainfall in the current year. Spray materials fall mainly into two groups (1) protective and eradicative, such as lime-sulphur [ibid., xii, p. 638] and, to a less degree, dry lime-sulphur, and (2) merely protective, such as wettable sulphurs, sulphur dusts, and copper sprays. Liquid lime-sulphur (1 in 60), applied thoroughly, gave good control; when it was applied after infection periods its effectiveness was much increased by the addition of lead arsenate. Of the substitutes for liquid lime-sulphur tested dry lime-sulphur was the best. Applied at the proper times wettable sulphurs [ibid., xiii, p. 358], particularly in the cover sprays or after petal-fall, were a desirable modification of the lime-sulphur programme; dry-mix, Koppers flotation sulphur paste, Koppers flotation dry-wettable [ibid., xiii, p. 34], magnetic spray (a wettable sulphur containing about 99 per cent. sulphur), sulfrox, and kolofog [ibid., xiii, p. 528] for all practical purposes gave as effective control as lime-sulphur. Untimely applications of wettable sulphur resulted in considerable scab. Coposil (a proprietary fungicide, consisting of copper ammonium silicate, designed to overcome certain disadvantages of Bordeaux mixture, and intended also for use with insecticidal oils) [ibid., xiv, p. 382] appeared to give commercial control of scab; hydrated lime (about 6 in 100) should always be used with it. In limited trials a copper phosphate, lime, and bentonite mixture (2–4–2–50) [ibid., xiv, p. 381] gave indications of being at least as good as coposil. Though the date when the first post-blossom application can safely be made varies with the kind of apple, as a general rule (though this may not apply to McIntosh apples) even the most promising copper sprays should not be applied until at least one month after petal-fall.

Lime-sulphur sprays at 1 in 40, 1 in 60, and 1 in 80 adhered to McIntosh foliage in proportion to the strength of the dilution, though they washed off at approximately the same rate. Dry lime-sulphur (3–5–50) gave a degree of protection between those given by liquid lime-sulphur 1 in 60 and 1 in 80. The results given by dry-mix resembled those obtained with liquid lime-sulphur. The evidence indicated that wettable sulphurs and sulphur dusts may give either less or more protection than lime-sulphur, according to the rate of application and the concentration used.

Sulphur dusts when applied to practically dry leaves and set by dew may be reduced to a common level of about half that of a dry-wettable spray with as little as 0·14 in. of rain.

Harrison (K. A.). **Mouldy core in Gravenstein Apples.**—*Sci. Agric.*, xv, 6, pp. 358–369, 1935. [French summary.]

Investigations [which are described, and the results of which are

tabulated and discussed] into the cause of 'mouldy core' [*R.A.M.*, x, p. 468], resulting in the premature dropping of Gravenstein apples in Nova Scotia, showed that the percentage of affected fruits depended directly on the percentage of open core, the latter condition resulting from rapid growth causing a break in the core tissues leading to an opening, usually in the calyx tube. The fungi present (*Alternaria tenuis* and *Fusarium* chiefly) were casual invaders. Affected apples were heavier than normal. Premature colouring appeared to be closely related to the condition in some instances, 60 to 75 per cent. of early matured fruits being affected, owing, probably, to excessively favourable growth conditions. Faulty pollination, which, by influencing the number of apples that set, indirectly affects their size, was also an important factor.

ATKINSON (J. D.). **Progress report on the investigation of corky-pit of Apples.**—*N.Z. J. Sci. Tech.*, xvi, 5, pp. 316–319, 1935.

The results are tabulated of recent experiments in the Nelson district of New Zealand in the control of 'corky-pit' of apples (also known locally as poverty-pit, cork, corky-core, brown heart, crinkle, drought spot, or bitter pit) [see next abstract] by the injection of weak solutions of various mineral salts, using an adaptation of Roach's method [*R.A.M.*, xiii, p. 641], through holes in the trunk. The varieties tested for this purpose were Sturmer, Jonathan, and Granny Smith. Two trees treated with boracic acid remained free from corky-pit, another given the same compound showed an incidence of 3 per cent. among the fruits, while all those supplied with other salts, as well as the uninjected controls, contracted variable percentages of disease (up to 100).

PLAGGE (H. H.), MANEY (T. J.), & PICKETT (B. S.). **Functional diseases of the Apple in storage.**—*Bull. Ia agric. Exp. Sta.* 329, pp. 34–79, 29 figs., 1935.

Semi-popular notes are given on some functional or non-parasitic disorders [*R.A.M.*, x, pp. 114, 467] of stored apples in the United States, namely, scald [ibid., xiii, p. 42], Jonathan spot [ibid., xii, p. 574], mealy and soggy breakdown [ibid., xiv, p. 243, and next abstract], brown heart [ibid., xiii, p. 36], water core [ibid., xiv, p. 520], bitter pit [ibid., xiv, p. 462], freezing injury, the allied conditions known as cork, drought spot, York spot, and crinkle [ibid., xiii, pp. 170, 709, and preceding abstract], and also on *Penicillium* soft rot or blue mould [*P. expansum*: ibid., xiii, p. 781; xiv, p. 287].

HARDING (P. L.). **Physiological behavior of Grimes Golden Apples in storage.**—*Res. Bull. Ia agric. Exp. Sta.* 182, pp. 317–352, 11 graphs, 1935.

The respiratory activity of apples just at the time of placement in storage was found to serve as an index to the storage capacity of the fruit, especially in respect of soggy breakdown [see preceding abstract]. Fruit picked and held at a fairly high temperature soon reached a high rate of respiration, and on transference to a lower temperature involving a retardation of activity a disturbance occurred within the tissue that was subsequently expressed by soggy breakdown. This condition de-

veloped with deferred storage when Grimes Golden apples at 50° F. were transferred during a period of high respiratory activity to 30°. The life of the fruit was prolonged by placing it in storage immediately after picking. A higher percentage of soggy breakdown developed in deferred storage fruit from plots receiving a high nitrogen (nitrate 5–5–10) treatment than in that from the control plots on which the nitrogenous fertilizer was omitted. At 50° the fruit from the former respired consistently more than that from the latter, whereas at 36° or 30° there was little difference.

Wormald (H.). **Further studies of the brown-rot fungi. VII. A shoot wilt in stools and layer beds of Plum stocks, and its relation to wither tip.**—*J. Pomol.*, xiii, 1, pp. 68–77, 2 pl., 1935.

A brief account is given of experiments in 1933 the results of which conclusively showed that the outbreak of 'shoot wilt' and 'wither tip' which was observed in 1924 in stools and layer rows of plum stocks at the East Malling Research Station [*R.A.M.*, ii, p. 547] was caused by *Sclerotinia laxa* [ibid., xiv, p. 367]. The shoot wilt was experimentally reproduced in pots by inoculating the basal leaves through punctures with water suspensions of spores, and later adding soil to cover the inoculated leaves, while wither tip resulted from similar inoculations of the upper leaves on the shoots. Control recommendations include the location of stool and layer beds of plum stocks in sites removed as far as possible from established plum trees, and the immediate removal of any shoots exhibiting symptoms of the trouble.

Koch (L. W.). **Investigations on the black knot of Plums and Cherries. III. Symptomatology, life history and cultural studies of Dibotryon morbosum (Sch.) T. and S.**—*Sci. Agric.*, xv, 6, pp. 411–423, 4 pl., 3 graphs, 1935. [French summary.]

Continuing the account of his study of the black knot fungus *Dibotryon morbosum* [*R.A.M.*, xiv, p. 177], the author states that more than 95 per cent. of new infections occur on current season's shoots and that at least 93 per cent. of all knots are visible as swellings during the autumn following infection. Some of these produce conidia during the autumn while perithecia frequently develop during the subsequent winter and spring. Almost invariably the invasion of the trunk results from infection through a small lateral. The host has a noticeable effect on the size of the ascospores, those from *Prunus pennsylvanica* having modes of 17 to 18 μ and 7 μ for length and width, respectively, whereas those on *P. domestica* were 16 μ and 6 μ. Ascospores only germinate when discharged from fully mature perithecia.

From each of 48 mono-ascosporous cultures of *D. morbosum* a species of *Hormodendrum* developed, showing 4 morphologically distinct strains. Additional proof of the genetic relationship was afforded by germinating ascospores which developed conidia typical of the *Hormodendrum* in 68 to 74 hours. Furthermore, when monosporous cultures were made from *Hormodendrum* conidia, colonies developed in every respect similar to those originating from ascospores, the same 4 morphologically distinct strains being observed. In several instances inoculations with ascospores or conidia gave knots which produced both stages. On 11 occasions

cultures from ascospores (3 from single spores) yielded a *Hormodendrum* which was quite hyaline [cf. ibid., viii, pp. 175] and less vigorous.

On the host the conidiophores of *D. morbosum* are erect, septate, usually simple, and measure 20 to 65 by 4 to 6 μ; the obovate, unicellular, light olivaceous-brown conidia are borne singly, usually at the apex of the conidiophore, and measure 4 to 8 μ by 2 to 5 μ. In culture the conidiophores vary greatly in length, frequently exceeding 100 μ and bear at the apex long dendroid chains of conidia measuring 3 to 20 by 2 to 5·5 μ.

WILLISON (R. S.). **Inoculation studies in Peach canker.**—Abs. in *Sci. Agric.*, xv, 6, p. 435, 1935.

When peach trees in Ontario were inoculated through wounds with monosporous cultures of *Valsa leucostoma* [*R.A.M.*, xiii, p. 246] and *V. cincta* isolated locally from peach cankers, as well as with *Sclerotinia americana* [*S. fructicola*: loc. cit.], the history of the wounds inoculated with *V. leucostoma* closely approximated to that of the uninoculated controls. *S. fructicola* produced some necrosis during the first two or three weeks, when the inoculations were made in the growing season, but little or none when they were made in winter. After the initial damage, healing progressed steadily except in a few wounds which became naturally contaminated with *Valsa* spp., generally with *V. cincta*. Inoculations with *V. cincta* during the dormant season and for four or five weeks before leaf fall produced cankers which either increased continuously, or increased and partly healed alternately; maximum necrosis resulted from infection at or about leaf fall, inoculations made in summer being comparatively innocuous.

GAUDINEAU (Mlle [M.]). **Observations sur les essais de traitement des arbres fruitiers à noyau dans le Sud-Ouest de la France.** [Notes on treatment experiments on stone fruit trees in south-western France.]—*Rev. Path. vég.*, xxi, 4, pp. 126–133, 1934. [Received July, 1935.]

The author states that spraying experiments since 1931 in south-western France (Lot-et-Garonne) showed that none of the peach varieties tested suffered from winter applications of neutral 2 per cent. Bordeaux mixture and anthracene oil against peach leaf curl [*Taphrina deformans*: *R.A.M.*, xiii, p. 76]. Certain early varieties (e.g., Mayflower and Amsden), however, are rather severely defoliated, under the local conditions, by spring applications of Bordeaux mixture, while no injury to them resulted from copper oxychloride sprays [ibid., xiii, p. 745], the efficacy of which against *Coryneum* [*Clasterosporium carpophilum*] and *Monilia* [*Sclerotinia laxa*] is now being tested.

FITZPATRICK (R. E.). **Further studies on the parasitism of Taphrina deformans.**—*Sci. Agric.*, xv, 6, pp. 341–344, 3 figs., 1935. [French summary.]

Preliminary studies at Toronto showed that infection of young peach trees in pots by *Taphrina deformans* [*R.A.M.*, xiii, p. 452; xiv, p. 374] occurred readily at temperatures between 50° and 70° F. Once infection

had taken place the severity of the disease was markedly affected by the conditions in which the trees were growing; at 70°, when the leaves were growing rapidly, the fungus died out, but at temperatures between 50° and 60°, when leaf development was slow, the incidence of leaf curl was high.

BARTHELET (J.). **Observations sur les maladies des rameaux de Framboisiers.** [Notes on the cane diseases of Raspberries.]—*Rev. Path. vég.*, xxii, 1, pp. 79–94, 5 pl., 1935.

The author gives notes on three parasitic fungi observed by him on raspberry canes in France. *Didymella applanata* [*R.A.M.*, xiii, p. 207], the taxonomy, morphology, and control of which are briefly discussed, has been recorded in France for more than 40 years. *Coryneum ruborum* [ibid., xiii, p. 288] produces on the shoots numerous, irregularly distributed black dots, frequently associated with cracks in the cortex. The fructifications measured in the author's material 300 μ in diameter, and contained spores 15 by 6 μ in diameter borne on conidiophores 14 to 40 μ long. The ascigerous stage (*Ascospora ruborum*) [ibid., iv, p. 490] was not found on the specimens examined. The third fungus, apparently of little economic importance, is considered to be a variety of *Cryptodiaporthe macounii* (Dear.) Wehm. [ibid., xiii, p. 270], and is named var. *rubi* (with a French diagnosis). It is characterized by small, intensely black, spherical or slightly flattened perithecia, 200 to 250 by 120 to 160 μ in diameter, aggregated in groups of four or six immediately under the cortical tissues. The asci are narrow, claviform, 30 to 35 by 5 μ, and contain distichous, bicellular, smooth spores, 8 to 10 by 2 μ in diameter. The pycnidia are of the *Phomopsis* type, scattered, sub-epidermal, black, round or flattened, and 0·5 to 1 mm. in diameter; the pycnospores are oblong, straight or slightly curved, 5 by 1 μ, and are borne on conidiophores, 12 to 15 μ in length.

SOKOLOFF (A. D.). Вредители и болезни Земляники и борьба с ними. [Pests and diseases of the Strawberry and their control.]—56 pp., 14 figs., Ленингр. Областн. Издат. [Leningr. Province Publ. Office] 1934. [Received July, 1935.]

The chief point of interest in this small pamphlet is the information that, in view of the opening up of new areas in the U.S.S.R. for strawberry cultivation and the presence in the old ones of certain insect pests and diseases, quarantine measures have been introduced to regulate the movement of planting material not only from abroad and from one district to another inland, but also among growers in the same locality. The two most important diseases of the crop in the government of Leningrad are stated to be leaf spot (*Mycosphaerella fragariae*) [*R.A.M.*, xiii, p. 786] and grey rot (*Sclerotinia fuckeliana*) [ibid., xii, p. 316], brief accounts of which are given.

MASSEE (A. M.). **On the transmission of the Strawberry virus 'yellow-edge' disease by the Strawberry aphis, together with notes on the Strawberry tarsonemid mite.**—*J. Pomol.*, xiii, 1, pp. 39–53, 3 pl., 1 plan, 1935.

The results of experiments in 1933 and 1934 at the East Malling

Research Station [a detailed account of which is given] are considered to have conclusively proved that the strawberry aphid (*Capitophorus fragariae*) is a vector of the strawberry yellow edge virus [*R.A.M.*, xiv, p. 179], but not the tarsonemid mite, *Tarsonemus fragariae*. There was some evidence that locally the optimum time for transference of the virus by the aphid is during June, and further work is in hand to determine this point.

SIMMONDS (J. H.). **Diseases of the Banana.**—*Qd agric. J.*, xliii, 3, pp. 254–267, 12 figs., 1935.

Notes are given in popular terms on the symptoms, etiology, and control of some important fungal and virus diseases of bananas in Queensland, reference to which has been made from time to time in this *Review*.

HEMMI (T.) & KURATA (S.). **Contributions to the knowledge of anthracnoses of plants II. On Gloeosporium olivarum Alm. causing the Olive anthracnose.**—*J. Soc. trop. Agric. Taiwan*, vi, 3, pp. 573–583, 3 figs., 1935.

Olive anthracnose, known in Portugal as 'gaffa' and caused by *Gloeosporium olivarum* [*R.A.M.*, xiii, p. 790], was reported from the Kagawa Agricultural Experiment Station, Nishimura, in October, 1930, this being apparently the first record of the disease in Japan. Infection was particularly severe on the Queen variety. The symptoms produced by the fungus are described and an account is given of its morphology, physiology, and pathogenicity. The optimum temperature for the growth of *G. olivarum* was found to be about 28° C. with a range from 5° to 40°. Almost identical results in respect of temperature relations were obtained in comparative experiments with *Glomerella cingulata* [cf. ibid., ix, p. 262], the agent of bitter rot of apples [ibid., xiv, p. 452], the growth characters of which, however, were quite different. The fact that the strain of *Gloeosporium olivarum* under observation assumes a pinkish tinge, especially on potato decoction agar, inclines the writers to regard it as possibly identical with the chromogenic form of apple *Gloeosporium* described by Shear and Wood (*Bull. U.S. Dep. Agric.* 252, 1913). Cross-inoculation experiments with *G. olivarum* and *Glomerella cingulata* gave positive results, the olive fungus producing on Jonathan and Ralls Janet apples symptoms resembling those of bitter rot, while conversely, the agent of bitter rot caused the development on Queen, Ammellenque, Sauren, and Mission olives of lesions similar to those of anthracnose, to which the last-named variety was relatively resistant. Sufficient differences exist, however, between the symptoms produced by the two fungi to maintain them as distinct entities—whether species or merely biologic forms is as yet uncertain. The retention of the name *Gloeosporium olivarum* is advocated for the present.

BENZ (P.). **Standardisierung der Schädlingsbekämpfungsmittel?** [The standardization of plant protectives?]—*Landw. Jb. Schweiz*, xlix, 2, pp. 204–220, 5 figs., 1935. [French summary.]

At the tenth conference on the control of fruit tree diseases and pests, held at Wädenswil, Switzerland, on 1st December, 1934, it was decided

that active steps should be taken to bring about the standardization of plant protectives, with special reference to fruit tree carbolineum [see above, p. 589], by means of agreements freely concluded between the manufacturers and experiment stations. To this end it will be necessary to revise and bring into line with modern scientific and practical knowledge the legal bases of such contracts, as defined in the 'Rules for the supervision of commerce in agricultural accessories' and the 'Manual of agricultural accessories'. The new manual will formulate the characteristics of all anti-parasitic products, and define their minimum content in active substances in relation to chemical composition and physical properties. Supervision will further be required for testing the efficacy of the preparations fulfilling the requisite conditions and calculating the profits to be gained by their use. A resolution was passed enjoining purchasers of plant protectives to co-operate in the work of standardization by dealing exclusively with recognized firms.

WINKELMANN (A.). **Untersuchungen über die Wechselbeziehungen zwischen Beizlösungen und Metallen.** [Investigations of the reciprocal action of steeping solutions and metals.]—*Tech. i. d. Landw.*, xvi, 2, pp. 41–42, 1935.

The results [which are tabulated and briefly discussed] of tests to determine the action of five standard German plant protectives on the metals used for the construction of seed steeping apparatus [*R.A.M.*, iv, p. 624] for the short disinfection process showed that nirosta steel and lead are not attacked by any of the preparations used. Ceresan liquid (U. 564) [ibid., xiv, p. 546] was practically innocuous to copper, which was, however, severely corroded by weizenfusariol. Abavit liquid 'Schering' was not appreciably injurious to iron, which suffered to some extent, on the other hand, from germisan and still more so from weizenfusariol. Aluminium and zinc were so heavily damaged by all the fungicides (including fusariol) used in the trials that their use for those parts of the apparatus coming into contact with the solution should be discontinued.

In the reciprocal tests of the action of the metals on the fungicides, nirosta steel failed to change the composition of the solutions. Copper caused a loss of the effective principle only in weizenfusariol, aluminium in all the preparations, and zinc in all but ceresan. Iron caused precipitation of mercury in abavit liquid, germisan, and weizenfusariol, while lead produced the same effect on the two last-named.

BRANAS (J.) & DULAC (J.). **Sur quelques effets des produits ajoutés aux bouillies cupriques.** [Note on some effects of substances added to cupric sprays.]—*Rev. Path. vég.*, xxii, 1, pp. 13–18, 1 fig., 1935.

Very brief details are given of laboratory experiments, the results of which indicated that the addition to Bordeaux mixture of a colloidal emulsion of resin [*R.A.M.*, xiii, p. 113] as an adhesive agent reduces the efficacy of the spray, inasmuch as it renders the spray deposit after drying on glass slides and vine leaves insoluble and impervious to water. This suggests the advisability of carefully testing the effect on the spray liquid of any substance recommended as spreader or adhesive agent prior to its adoption in general practice.

ANTHONY (M. V.). **Apparatus for dusting sulfur on plants in controlled amounts.**—*Science*, N.S., lxxxi, 2102, p. 364, 1 diag., 1935.

In the course of comparative studies on different brands of sulphur, the need was experienced for an apparatus capable of delivering quantitatively small amounts of the disinfectant to the under sides of leaves. A dust gun was made from a small glass cylinder (80 by 15 mm.) fitted with a cork at each end, into one of which was inserted a metal tube with a 1 mm. aperture to admit compressed air at 20 lb. pressure and controlled by a valve obtained from a cheap spray gun. From the other cork led a glass tube, fire-polished to a 1 mm. aperture and connected by a rubber tube with the dusting chamber. The latter consisted of a large wooden box containing a phonograph turn table which was used to transmit power to a cylindrical tin held at an angle of 45° with the open end down. Into this tin were inserted plants grown in flower pots which revolved in their container with each turn of the phonograph. The sulphur came into the dusting chamber, hit a glass plate, and dispersed evenly over the revolving plant. To secure free passage of air through the dust gun a small rod is held in its centre while filling and then withdrawn so as to leave a cylinder of dust through the centre of which the air passes.

The dust gun may be converted into a very useful, small hand-duster by attaching a rubber bulb to the glass tube and a cheese cloth over the other end. A rod is held in the centre of the glass cylinder while filling, as in the case of the gun. The cheese cloth prevents the emission of coarse particles from the duster and simultaneously diffuses large puffs of dust.

TISDALE (W. H.). **Higher alcohol sulphates as spreading agents for insecticides and fungicides are studied.**—*Agric. News Lett.*, iii, 3, pp. 4–5, 1935. [Mimeographed.]

Extensive experiments and field demonstrations carried out during the past three years by the Du Pont Company and the Grasselli Chemical Company showed that the higher alcohol sulphates are excellent wetting and spreading agents for use with fungicides. In sprays, some are effective at dilutions of 0·025 per cent. They are also useful in the preparation of emulsions, can be employed in acids and dilute aqueous alkali solutions, and they withstand hard waters. Sodium lauryl sulphate (IN 181) and sodium oleyl sulphate special (IN 438) appeared to be the best for wetting and spreading purposes, the former for use with dusts, the latter with sprays.

BARILLET (F.) & CHOISNARD (A.). **Les parasiticides.** [Parasiticides]—*Industr. chim., Paris*, xxii, 255, pp. 245–250, 3 diags., 1935.

The physical and chemical requirements of liquid, solid, and gaseous agricultural disinfectants and various methods of determining them are discussed. According to a standard established at the Wädenswil (Switzerland) Agricultural Experiment Station [see above, p. 596], lime-sulphur mixtures should contain a minimum of 100 gm. sulphur per l. as polysulphides. Attention is drawn to the specifications recently issued by the English authorities [*R.A.M.*, xiii, p. 713].

Sproeien en sproeiers. [Sprays and spraying apparatus.]—*Versl. PlZiekt. Dienst Wageningen* 33 (5th edn.), 60 pp., 8 pl., 1935.

This is a revised and amplified version of the directions previously issued [*R.A.M.*, xi, p. 315] for the control of insect pests and fungous diseases of economic plants in Holland by the application of standard disinfectants, supplemented by information on the various types of machinery in use, the average cost and correct execution of treatment, and other points of interest.

Middelen tegen plantenziekten en schadelijke dieren. [Remedies against plant diseases and noxious insects.]—*Versl. PlZiekt. Dienst Wageningen* 43 (4th edn.), 46 pp., 1935.

This is a revised and enlarged edition of a previous pamphlet in the same series dealing with standard preparations, including many of international repute, for the control of plant diseases and pests [*R.A.M.*, ix, p. 730].

Renn (C. E.). **A Mycetozoan parasite of Zostera marina.**—*Nature, Lond.*, cxxxv, 3414, pp. 544–545, 1935.

The parasitic habit of the *Labyrinthula*-like organism found associated with the wasting disease of *Zostera marina* along the American Atlantic coast [*R.A.M.*, xiii, p. 793] is stated to have been demonstrated by observing the migration of the fusiform cells from diseased leaf fragments and into healthy leaf tissues. Consistent infection occurred, usually within 8 to 48 hours. In several eelgrass beds near Woods Hole, Massachusetts, slips of diseased and normal leaf were attached in alternate order to healthy green foliage, which developed the local darkening and characteristic streaking observed in nature after one or two days. The experiment was repeated four times during the late summer and corresponding tests were made in aquaria with identical results. Sections prepared from the newly infected areas showed heavy infestation by the pathogen in a viable state and these sections infected clean plants to which they were attached. The *Labyrinthula* failed to grow on artificial media or in filtered sea water.

The mycelium of the *Ophiobolus* isolated from diseased *Zostera* by Petersen, Miss Mounce, and Tutin [*O. halimus*: ibid., xiv, p. 50] is stated to be far from universally present in the region under observation, though sometimes found near Woods Hole. No trace of *Labyrinthula* could be found in the longer, wider-leaved form of *Z. marina* in Departure Bay, British Columbia, on the Pacific Coast [see next abstract].

Butcher (R. W.). **Wasting disease of Zostera marina.**—*Nature, Lond.*, cxxxv, 3414, p. 545, 1935.

Referring to the supposed connexion between leaf width in *Zostera marina* and susceptibility to wasting disease [*R.A.M.*, xiv, p. 245, and preceding abstract], the writer suggests that leaf size is due to the nutritional balance in the plant and that the present relative distribution of the large leaf type and *Z. marina* var. *angustifolia* is due to a large number of circumstances, not a single catastrophic event.

LAMI (R.). **Travaux récents sur la maladie des Zostères.** [Recent investigations on the *Zostera* disease.]—*Rev. Bot. appl.*, xv, 164, pp. 263–266, 1935.

Briefly summing up the outcome of recent investigations on the wasting disease of 'varech' (*Zostera marina*) in France [*R.A.M.*, xiii, p. 46] and elsewhere [see preceding abstracts], the writer emphasizes its steadily increasing economic importance, not only on account of the loss of a valuable material for packing, stuffing, and the like, but also because fish, crustaceans, and molluscs are thereby deprived of shelter and lose the nutriment from the abundant animalculae which are found among the *Zostera* beds, with disastrous results. In some cases of complete destruction even the mud or sand forming the foundation of the beds has been washed away by the waves, so that reconstitution seems impossible. In some places there was a certain amount of regeneration of the beds during the summer of 1934 but this was often followed by a distinct regression in the winter.

DUFRÉNOY (J.). **L'immunité des plantes vis-à-vis des maladies à virus.** [The immunity of plants in respect of virus diseases.]—*Ann. Inst. Pasteur*, liv, 4, pp. 461–512, 16 figs., 1935.

This is a comprehensive survey and discussion of recent important advances towards the understanding of the problem of immunity in plants in relation to virus diseases [*R.A.M.*, xiii, p. 116]. Notices of all the work in question have appeared from time to time in this *Review*.

RIVERA (V.). **I virus filtrabili nella patologia vegetale.** [Filterable viruses in plant pathology.]—*Atti Congr. naz. Microbiol., 1934*, pp. 91–137, 4 figs., 1935.

This paper describing the author's investigations into mixed virus and *Bacterium tumefaciens* infections has already been noticed from another source [*R.A.M.*, xiv, p. 384]; a bibliography extending to two and a half pages is appended.

CALDWELL (J.). **On the interactions of two strains of a plant virus; experiments on induced immunity in plants.**—*Proc. roy. Soc.*, Ser. B., cxvii, 803, pp. 120–139, 3 pl., 1935.

The author gives a brief account of his discovery in the spring of 1933 of a strain of the yellow (aucuba) mosaic virus of tomatoes (Johnson's tobacco virus No. 6) [*R.A.M.*, xiv, pp. 261, 474, 535], which on tomatoes consistently produced a very faint mottle, typical of very mild 'winter' symptoms, with little leaf distortion or stunting of the plant, and also differed from the ordinary yellow mosaic virus in the symptoms caused by it on *Nicotiana glauca*, *N. glutinosa*, tobacco, *Solanum nodiflorum*, and *Zinnia* sp. Further studies gave evidence that this virus is a distinct strain and not an attenuated form of the other [cf. ibid., xiii, p. 649], since its virulence was not enhanced by repeated passage through susceptible plants, and there was also an indication that many of the anomalies now observed in symptom expression in host plants may probably be referred to the existence of hitherto unrecognized strains of the virus.

In special tests it was shown that preliminary inoculation of healthy host plants with one of the strains apparently completely immunizes them against infection with the other [loc. cit.]. Similar immunization experiments were performed with other tomato and tobacco viruses, the results of which indicated that four types of interaction between viruses may be distinguished, namely: (*a*) a virus may completely inhibit the development of another in the host tissues; (*b*) the second virus may multiply in the tissues without inducing typical disease symptoms; (*c*) the two viruses may multiply, each inducing symptoms typical of its specific disease; and (*d*) the effect of the second virus may be to intensify the severity of the disease symptoms induced by the single virus. The paper terminates with a brief discussion of the significance of these observations in relation to the multiplication of the virus in the host tissues. It is believed that there must be either only a few foci in the tissues at which the virus can multiply, or more probably, that there is in type (*a*) some reaction of the plant to the first virus infection which prevents the multiplication of the second.

YOUDEN (W. J.), BEALE (HELEN P.), & GUTHRIE (J. D.). **Relation of virus concentration to the number of lesions produced.**—*Contr. Boyce Thompson Inst.*, vii, 1, pp. 37–53, 5 graphs, 1935.

A comparative study is made of the virus dilution curves published in the literature dealing with Holmes's local lesion method for the estimation of the active virus concentration [*R.A.M.*, xiv, p. 197] in extracts from *Nicotiana glutinosa*, *Phaseolus vulgaris* (Early Golden Cluster), and *Vigna sinensis* (Black Eye) experimentally infected with tobacco mosaic, ring spot, cucumber mosaic, and tomato aucuba mosaic [Johnson's tobacco virus No. 6: see preceding abstract]. It is claimed that these data are not inconsistent with the concept that the number of local lesions may be expressed in the form of the function $y=N(1-e^{-ax})$, in which y is the number of lesions obtained with any given concentration x of the virus, N represents the maximum number of lesions obtainable (possibly the number of susceptible areas available on the host leaves), e is the base for natural logarithms (2·718), and a is a constant representing a property of the virus preparation (assumed to be the average number of infective virus particles per susceptible area of the host leaf). Stated in another way, this function is what one would expect the curves to follow if the lesions resulted from a random distribution of virus particles on a number of susceptible areas, each receiving one or more particles forming a lesion. The method of evaluating the constants is also given, and their possible significance is discussed.

PYKE (E. E.). **Mycorrhiza in Cacao.**—*Rep. Cacao Res., Trinidad, 1934*, pp. 41–48, 3 figs., 1935.

Examination of cacao roots from different localities in Trinidad showed that an endotrophic mycorrhiza was present in most of the samples. In the simplest types the fungus had an external phase consisting of hyphae which ramified on the root surface, forming local, denser aggregates, where appressoria developed from which hyphae entered the epidermal cells and by intracellular growth traversed one or

more layers of the outer cortex. An extensive intracellular mycelium also developed in the cortex, consisting of coarse, non-septate hyphae coiled in a worm-like manner in the lumina of the cells. In the adjacent deeper layers the mycelium appeared, in sections, as branched, tree-like arbuscles.

Costantin [J.] & Magrou [J.]. **Étude des mycorhizes de la Pomme de Terre sur des pieds sains et sur des pieds atteints de mosaïque.** [Study of Potato mycorrhiza on healthy plants and on plants affected with mosaic.]—*Rev. Path. vég.*, xxii, 1, pp. 60–62, 1935.

The authors state that two virus-free potato varieties (Arran Victory and Bevelander) grown in 1934 at altitudes of 1,400 and 560 m., respectively, showed a normal and abundant development of mycorrhiza in their rootlets [cf. *R.A.M.*, xiii, p. 536], while the development of the symbiotic organism was very strongly inhibited in plants of the Eigenheimer variety affected with mosaic, which were grown at the same altitudes.

Romell (L. G.). **Ecological problems of the humus layer in the forest.**—*Mem. Cornell agric. Exp. Sta.* 170, 28 pp., 1 pl., 1935.

The author accepts P. E. Müller's two main types of humus layer, mull and mor, of which the former is stated to be ecologically the richer of the two, predominating in forests of broad-leaved trees in relatively mild temperate climates, whereas the latter extends through the belt of coniferous forests in the colder parts of the temperate zone. In pronounced mor types, the soil life is completely dominated by fungi, the fibres being woven together by roots and hyphae to form a tough mat. In mull, on the other hand, the fungus flora is relatively scanty, being largely replaced by bacteria. With few exceptions the fungi and bacteria of importance in mor and mull are unidentified. The nature of the decomposition proceeding in mull (bacterial) is quite different from that resultant on fungal activity in mor, acidity being produced only to a slight extent in the former but probably constituting a direct outcome of disintegration in the latter. Owing to the profusion of nitrogen-absorbing mycelia of mycorrhizal and other fungi in mor it is evident that the nitrogen level or average concentration of available nitrogen will be considerably higher in mull. The changes leading to the formation of one or other type and the ecological significance of the two types are discussed in some detail, while the application of the biological theory of their formation to silvicultural practice is briefly considered.

Carbone (D.) & Arata (Mlle M.). **Sul meccanismo dell' immunità acquisita nelle piante.** [On the mechanism of acquired immunity in plants.]—*Atti Congr. naz. Microbiol.*, 1934, pp. 138–145, 1935.

This paper dealing with certain histocytological aspects of plant immunity, with special reference to the defensive reactions of beans [*Phaseolus vulgaris*] inoculated through wounds with the 'toile' disease organism [*Botrytis cinerea*: *R.A.M.*, xiv, p. 188], is an Italian version of one already noticed from another source in French [ibid., xiii, p. 795].

NEWTON (W.) & MAYERS (N.). **The physiology of Rhizoctonia solani Kühn. III. The susceptibility of different plants as determined by seedling infection. IV. The effect of a toxic substance produced by Rhizoctonia solani Kühn when grown in liquid culture, on the growth of Wheat, Carrots, and Turnips.**—*Sci. Agric.*, xv, 6, pp. 393–401, 2 figs., 1935. [French summaries.]

In tests carried out in British Columbia in which pot seedlings were grown in soil inoculated with *Rhizoctonia* [*Corticium*] *solani*, wheat [cf. *R.A.M.*, xii, p. 159], oats, red, crimson, and Mammoth White Dutch clovers were immune from or highly resistant to infection (as judged by lesions on the roots) [cf. ibid., vi, p. 748], lucerne [ibid., v, p. 19], sunflower [ibid., vi, p. 748] and perennial rye grass [*Lolium perenne*] resistant, and peas [ibid., xii, p. 671], beans [ibid., xiii, p. 725], vetch, buckwheat, and timothy [*Phleum pratense*] susceptible; turnips and carrots [ibid., xi, p. 97] were stunted, but showed no other symptom.

Further tests demonstrated that heat-sterilized filtrates of old liquid cultures of *C. solani* were much more toxic towards carrot and turnip than towards wheat seedlings. Hot water extracts of washed, dried and ground mycelium were toxic to turnips but not to wheat. The evidence obtained indicated that a heat-stable toxin is liberated by *C. solani* during growth and is also present in the mycelium.

NORMAN (A. G.). **Fungi for food.**—*Food Manuf.*, x, 4, pp. 129–131, 4 figs., 1935.

Attention is drawn to the potential uses of certain of the lower fungi, especially moulds, in the preparation of substances for human and animal consumption. *Aspergillus niger* is already used to produce citric acid on an industrial scale [*R.A.M.*, xii, p. 434 and next abstract], and *A. oryzae* is the source of the valuable taka-diastase [ibid., x, p. 559]. A very elaborate survey of fungal metabolic activities is stated to have been made by Imperial Chemical Industries, Ltd., and the work is being continued by Prof. Raistrick at the London School of Hygiene and Tropical Medicine [cf. ibid., xiv, p. 522]. In two foreign institutions, one in the United States (Wisconsin) and the other in Japan, studies are in progress on the actual composition of the fungi affording direct nutritive possibilities and on the conditions promoting the maximum yield of tissue. Chemical analyses of a large number of fungi grown on a liquid medium of glucose and inorganic salts, with nitrogen in the form of ammonium nitrate, showed the major groups of constituents to be present in the following approximate average proportions: protein 32 per cent., fats and lipoids 6, carbohydrates 58, and ash 5. Under favourable conditions the yield of fungal tissue amounts to about one-third of the sugar fermented; that is to say, from 10 lb. glucose about 3 lb. tissue could be obtained, about 1 lb. of which would be protein. The chief structural constituent of the lower fungi appears to be a form of chitin containing acetyl glucosamine, while carbohydrates are present in the form of glucose polysaccharides. Interest has latterly been aroused in the sterol group, the content of which in a large number of mould samples has been found to average 0·75 per cent. Mould tissue could therefore be used as a source of ergosterol, and if irradiated would be

potent in anti-rachitic (vitamin D) properties. Feeding trials on rats with mould tissue have shown that the addition of small quantities of dried yeast or casein is necessary to promote normal growth.

HOROWITZ-WLASSOVA (Mme L. M.) & NOVOTELNOW (N. W.). **Zur Frage der Zersetzung der Pentosane und der Pentosen durch Mikroorganismen.** [A contribution to the problem of the disintegration of pentosans and pentoses by micro-organisms.]—*Zbl. Bakt.*, Abt. 2, xci, 22–26, pp. 468–481, 1935.

The capacity for hydrolysing pentosans was found in the writers' experiments with crushed sunflower husks and cotton seed from Leningrad oil mills to be marked in a group of moulds including *Aspergillus niger*, *A. oryzae*, and species of *Dematium*, *Penicillium*, and *Monilia*. Certain fungi, such as a species of *Sterigmatocystis* [*Aspergillus*], proved to be able to ferment the pentoses (especially xylose) thus formed with the production of organic acids, e.g., citric [see preceding abstract] and oxalic, a capacity shared by several groups of bacteria. Attention is drawn to the industrial possibilities of the expressed residues from oil mills, with their high pentosan content, in the production of various organic acids, including acetic, lactic, butyric, citric, and oxalic.

MEHRLICH (F. P.). **Nonsterile soil leachate stimulating to zoosporangia production by Phytophthora sp.**—*Phytopathology*, xxv, 4, pp. 432–434, 1935.

This is a fuller account than that already published of the writer's experiments in the stimulation of zoosporangial development in *Phytophthora cinnamomi* and other species of *Phytophthora* causing pineapple heart rot in Hawaii by four days' culture on maltose-malt extract broth at 25° to 27° C., followed by washing in sterile distilled water and incubation at 21° to 25° in a non-sterile soil percolate [*R.A.M.*, xiv, p. 194]. The fact that the zoosporangia produced by *P. cinnamomi* under these conditions are papillate, in contrast to the non-papillate type described by other workers, suggests that the presence or absence of papillae is of doubtful taxonomic value.

Ziekten van Aardappelknollen. [Diseases of Potato tubers.]—*Versl. PlZiekt. Dienst Wageningen* 9 (5th edn.), 20 pp., 4 pl., 1934. [Received June, 1935.]

In this revised version of a pamphlet previously issued in the same series, notes are given in popular terms on 28 different types of potato tuber rots or blemishes commonly observed in Holland [*R.A.M.*, viii, p. 400].

LOUGHNANE (J. B.) & CLINCH (PHYLLIS). **Composition of interveinal mosaic of Potatoes.**—*Nature, Lond.*, cxxxv, 3420, p. 833, 1935.

According to Koch and Johnson, a specimen of interveinal mosaic of potato received from the Albert Agricultural College, Glasnevin, Dublin, contained a 'streak' apparently identical with the 'potato streak virus' described by those writers from Madison, Wisconsin [*R.A.M.*, xiv, p. 523]. It had already been ascertained in the course of the Irish investigations in 1933–4 that the particular form of interveinal mosaic in

question results from the combined action of two different viruses, one of which may correspond to the American 'streak', since there is no evidence of a third constituent.

One component of interveinal mosaic is a virus of the X type having no known insect vector, while the other is selectively transmitted under certain conditions by *Myzus persicae*, and has been isolated both in this way and by passage through the Arran Crest variety, in which the X virus does not survive.

The virus separated by these methods sometimes produces on President foliage a slight, transient mottle, but in the cortex and pith of the tubers characteristic, irregularly distributed necrotic blotches; it is regarded as responsible for the latter symptom in interveinal mosaic. The virus, the exact identity of which remains to be established, appears to be related to, or identical with, that causing phloem parenchyma necrosis or pseudo-net necrosis [ibid., ix, p. 438 *et passim*].

Another diagnostic character of the virus is its capacity for combining with simple mosaic (virus X) and intensifying it to the interveinal form in a variety tolerant of both. Thus, the simple mosaic element alone would cause this symptom in Arran Crest, while the tuber blotch virus was presumably responsible for the streak produced by Koch and Johnson in the experimental Bliss Triumph, since the plants already carried the equivalent of simple mosaic.

The tuber blotch virus is readily inoculable into White Burley tobacco and *Datura stramonium*, but it is carried by the latter and probably also by the former. It does not survive nine days *in vitro* at room temperature, and unlike the X virus, does not pass the L3 or L5 Pasteur-Chamberland filters.

PUTNAM (D. F.). **The analysis of a complex mosaic of President Potato.**—Abs. in *Sci. Agric.*, xv, 6, p. 437, 1935.

The President variety of potato, known in Nova Scotia as Never Rot, has been observed for a number of years to suffer from a complex mosaic of which two of the three components appear to be identical with the veinbanding and mottle viruses [*R.A.M.*, xiv, p. 524] found in rugose mosaic, while the third, producing the typical yellow mottle associated with the disease, does not seem to have been previously reported. It belongs to the X group [ibid., xiv, p. 388], is filterable and transmissible by the sap of infected plants, but not by the aphid *Myzus persicae*, fairly resistant to ageing and chemical action, and has a thermal death point of about 72° C.

JONES (W.). **Soft rot of Potatoes caused by Pythium ultimum Trow.**—*Sci. Agric.*, xv, 6, pp. 402–410, 2 figs., 1935. [French summary.]

The soft rot of potatoes caused by *Pythium ultimum* [cf. *R.A.M.*, x, p. 54; xiv, pp. 259, 520] is stated to be fairly widespread in British Columbia, causing considerable losses especially after planting in spring. In artificial inoculation experiments infection was found to progress very rapidly at the optimum temperature for the growth of the fungus (25° to 31° C.), complete internal disintegration sometimes taking place within four days. The optimum hydrogen-ion concentration for the development of *P. ultimum* was found to lie between $P_H 6$ and 8.

None of the 15 standard varieties tested gave any evidence of resistance to infection. Mangel, beet, and carrot roots also proved susceptible to attack. Whole uninjured tubers did not contract infection when planted in soil inoculated with the fungus. A reduction in the incidence of infection was obtained by dusting the cut sets with sulphur followed by postponement of planting for 24 hours, and also by merely allowing the cut sets to form a callus in a humid atmosphere for 48 hours at room temperature. Freshly cut sets may become infected both in wet and very dry soils, the latter, however, being somewhat less favourable to the fungus than the former.

Meyer-Bahlburg [W.]. **Phytophthora-Vorbeuge und Bekämpfung.** [*Phytophthora* prevention and control.]—*Dtsch. landw. Pr.*, lxii, 17, p. 208, 1935.

Although the writer states that some benefit in increasing resistance to potato blight (*Phytophthora*) [*infestans*: *R.A.M.*, xiv, p. 527] accrues from liberal applications of phosphoric oxide fertilizers, especially superphosphate, when combined with appropriate amounts of nitrogen and potash, control of this disease should be primarily by selection of resistant varieties. Among yellow-fleshed varieties may be specially mentioned the new Voran and Ackersegen, the latter having shown excellent blight resistance in the wet season of 1931. Ebstorfer Goldfink is another valuable yellow-fleshed variety, being well adapted to the lighter types of soil. Resistant white-fleshed varieties include Parnassia, P[ommersche] S[aat] G[esellschaft] Max Delbrück, Paulsens Hellena, and P. S. G. Gneisenau.

Mader (E. O.) & Blodgett (F. M.). **Effects of modifications of the Potato-spray program.**—*Bull. Cornell agric. Exp. Sta.* 621, 34 pp., 1935.

The results [which are tabulated and fully discussed] of five years' spraying and dusting trials with Rural potatoes in western New York showed that the treatment profitably increased yields even in the absence of *Phytophthora infestans* [*R.A.M.*, xii, p. 653].

Maximum yields were given when the spray was applied at a pressure of 400 lb., using at least 116 galls. per acre per application. When as much material was applied at 400 as at 600 lb. pressure there was no significant difference in yield, and increasing the amount of material applied at 600 lb. (125 galls. per application) gave lower yields than those given by 116 galls. at the same pressure or even at 400 lb. The gain in yield at 400 lb. over 200 lb. pressure (averaging 38 bushels) per acre was large enough to make spraying at the higher pressure profitable. Economically the best results were obtained by using a mixture containing a total of 75 lb. copper sulphate per acre per season at 400 lb. pressure, this giving an increased yield over the unsprayed controls of 118·1 bushels per acre.

Spray schedules in which most of the copper was applied early in the season consistently gave higher yields than those in which it was evenly distributed throughout (average difference, 22·9 bushels per acre), and those in which heavy applications were made late (average difference, 31·1 bushels per acre).

One season's evidence indicated that when most of the copper was applied early, enough remained to prevent subsequent infection by *P. infestans.*

Comparison of Bordeaux mixtures made with different kinds of lime showed a slight difference in the average yields in favour of high-magnesium lime (finishing lime) [ibid., xii, p. 391].

Dusting at carefully selected times was as effective as spraying, though more copper (in the form of copper-lime dust) was required to obtain maximum yields than was used in the spray. With dusting also, additional gains resulted from applying much of the copper early and reducing the amount of lime.

SANFORD (G. B.). **On the merit of treating Potato tubers to reduce disease and loss caused by Rhizoctonia solani Kühn.**—Abs. in *Sci. Agric.*, xv, 6, p. 436, 1935.

The treatment of potato tubers in typical eastern Canadian and Alberta soils with effective mercuric chloride solution plus 10 per cent. by volume of hydrochloric acid entirely failed to prevent the transmission of *Corticium solani* to the stem 32 days after planting, from viable sclerotia on the sets, in 8 out of 11 tests [*R.A.M.*, xii, p. 530; xiv, p. 497], neither were significant results obtained from this method of disinfection in a single case where the data were based on total yield or yield of marketable tubers at harvest.

HOERNER (G. R.) & SMITH (D. C.). **A new canker of Hops in Oregon.**—*Phytopathology*, xxv, 4, pp. 437–439, 1 fig., 1935.

A hitherto unreported hop canker was observed in Oregon in June, 1934, affecting the internodes or sometimes the tips of untrained shoots, or more rarely the petioles. The cankers almost invariably developed where the shoots touched the soil, usually under exposure to sunshine. The disease appeared to be most prevalent on sandy soils. The shoot lesions developed as yellow to light brown areas, generally turning dark brown or nearly jet-black and reaching a length of several inches. Especially during bright, hot periods, the lesions often exude drops of a clear liquid that soon darkens and becomes more viscid. The cankered areas wilt and shrivel, causing the death of the shoot beyond the point of infection. Apparently pure cultures of bacteria were obtained on agar slants from the canker exudate. The hop varieties affected are Early and Late Clusters and Fuggles.

Report of the Puerto Rico Agricultural Experiment Station, 1934.—24 pp., 7 figs., 2 graphs, 1 map, 1935.

During the period under review, cuttings of the mosaic-resistant sugar-cane varieties Mayaguez 28 and 63 were issued to 95 farmers in Porto Rico, where the acreage sown to the former variety more than doubled [*R.A.M.*, xiii, p. 539]; in four localities it was the most widely planted variety. For eight years it has resisted mosaic even in fields adjoining infected cane. It developed, however, much rotten cane in late-cut 'gran cultura' [cane planted in summer or autumn and harvested at 16 to 18 months] in two localities and in first ratoons in a third,

and growers are again cautioned against extending this variety in 'gran cultura' on humid lowlands, particularly in areas of heavy rainfall.

OCFEMIA (G. O.). **Two rusts hitherto unreported on economic hosts from the Philippine Islands.**—*Philipp. Agric.*, xxiii, 10, pp. 880–885, 3 figs., 1935.

Brief descriptions are given of the symptoms and morphology of two newly detected rusts on economic plants in the Philippines, namely, *Uromyces musae* (determined by Ashby) on Halipo bananas and the aecidial stage of *Puccinia tubulosae* (determined by Arthur) on eggplant. The latter is stated by Arthur to have been collected in its uredo stage on *Digitaria* [*Panicum*] *sanguinale* in the Philippines in 1925. Both rusts are confined to the foliage, *U. musae* producing brown, elongated, raised uredosori, generally in rows of 10 to 12 mm. long, on the lower leaf surfaces of the banana, while on eggplant the orange, mucilaginous pycnidia of *P. tubulosae* occur in profusion on both sides, with relatively few aecidia. The damage caused by both fungi is considerable.

SERVAZZI (O.). **Intorno ad alcune Pestalotia.** [On some species of *Pestalozzia.*]—*Difesa Piante*, xii, 1, pp. 22–32, 4 figs., 1935.

In continuation of his earlier paper [*R.A.M.*, xiii, p. 598] the author gives further notes on the morphology, systematic position, and pathogenicity of a number of species of *Pestalozzia* isolated from ornamental plants in Italy, the records made including *P. palmarum* [ibid., xi, p. 780] on *Howea forsteriana*, *P. gracilis* on *Cryptocarya peumus*, *P. macrotricha* on *Kalmia latifolia*, and *P. funerea* on *Thuja occidentalis* [ibid., xiii, p. 598].

North Florida Experiment Station.—*Rep. Fla agric. Exp. Sta. 1933–34*, pp. 113–121, 5 figs., [1935].

In further soil temperature studies by L. O. Gratz and R. R. Kincaid under controlled conditions, the lowest temperature at which black shank (*Phytophthora parasitica nicotianae*) [*R.A.M.*, xiii, pp. 275, 806; xiv, p. 473] symptoms appeared in newly transplanted Round Tip tobacco within fifteen days after transplanting in infested soil was about 16° C. The optimum temperature for the development of the disease was about 27° or 28°, and the maximum about 34°. When several selections of wrapper tobacco of hybrid origin at Everglades showing promising field characters were planted in triplicate in 1/15 acre plots, less than 1 per cent. of the plants of each type had developed black shank wilt by the end of the priming season.

Plantenziekten waarmede rekening moet worden gehouden bij de keuring te velde van landbouwgewassen. [Plant diseases to which attention must be paid in the field certification of agricultural crops.]—*Versl. PlZiekt. Dienst Wageningen* 11 (3rd edn.), 12 pp., 8 pl., 1935.

Popular descriptions are given of the symptoms of certain diseases affecting the cereal, legume, flax, and beet crops in Holland with a view to facilitating their detection in the course of field certification work.

IMPERIAL MYCOLOGICAL INSTITUTE

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McMURTREY (J. E.). **Boron deficiency in Tobacco under field conditions.** —*J. Amer. Soc. Agron.*, xxvii, 4, pp. 271–273, 1 fig., 1935.

In field experiments carried out in Maryland, the use for a five-year-period of relatively pure chemicals in the preparation of tobacco fertilizer mixtures resulted in the development of pronounced boron deficiency symptoms [*R.A.M.*, xiii, p. 600]. The first indication of the disturbance is a pallor of the bud leaves, especially at the base, rapidly followed by more or less extensive collapse of the tissues. Near the top of the plant growth may be unilateral or contorted. The final manifestation is a die-back of the terminal bud. Lateral buds (suckers) may develop in the leaf axils or at the base of the stalk, but they usually break down in a similar manner.

PETRE (A. W.). **Factors influencing the activity of Tobacco mosaic virus preparations.**—*Contr. Boyce Thompson Inst.*, vii, 1, pp. 19–28, 1 fig., 1 diag., 1935.

The author briefly describes certain improvements in Vinson's and Petre's lead precipitation method for the separation and purification of the tobacco mosaic virus from tobacco leaves [*R.A.M.*, x, p. 761]. It was shown that the removal of the pigment, which occurs in greater concentration in sap from field-grown tobacco plants, was facilitated by increasing the concentration of potassium acid phosphate in the preliminary elution; the activity of the virus removed in the final eluate was increased by increasing the acidity of the potassium acid phosphate buffer in the preliminary elution, but this was less effective in removing the pigment. In the final elution, the lead acetate precipitates from juice of field-grown tobacco plants required an alkaline phosphate buffer of higher P_H than 6·5 to exhibit their full activity, good results being obtained at P_H values of 7·5 and 8·4.

The experiments also indicated that tobacco plants grown in glass cages were less susceptible to infection with tobacco mosaic and more succulent than plants grown in the greenhouse, suggesting an inverse relationship between succulence of the plants and their susceptibility. Rate of leaf expansion (growth) did not appear to be a factor in susceptibility.

Valleau (W. D.). **A probable case of sulphur starvation in Tobacco.**—*Phytopathology*, xxv, 4, pp. 430–432, 1 fig., 1935.

An unusual form of apical chlorosis of the upper first to third leaves of topped White Burley tobacco plants [cf. *R.A.M.*, xiv, p. 534] observed in Kentucky in 1934 is tentatively attributed to sulphur deficiency [ibid., xi, p. 805]. In some cases the greyish-yellow discoloration extended well down along the edges of the leaves. The affected plants were growing in hard, cracked soil in hilly areas liable to extensive erosion. The chlorotic portions of the foliage turned chamois- to honey-yellow (Ridgway) on curing, in contrast to the normal cinnamon-brown. Chemical analyses supported the conclusion regarding a low sulphur content in the affected leaf tips, which were further deficient in various other elements, including phosphorus, magnesium, potassium, and calcium [cf. ibid., viii, p. 473; xii, pp. 731, 732].

Berkeley (G. H.). **Occurrence of 'spotted wilt' of Tomato in Canada.**—*Sci. Agric.*, xv, 6, pp. 387–392, 3 pl., 1935. [French summary.]

Since 1931 a disorder suspected to be spotted wilt of tomatoes has been present in Ontario, but only in 1934 was it possible to undertake experimental studies which showed conclusively that this or a very closely related disease is present in that Province and Saskatchewan.

The symptoms are briefly described and differentiated from those of streak [*R.A.M.*, xiv, p. 404], the relevant literature is summarized, and notes are given on the distribution and importance of the disease. Positive results were given by inoculation experiments on Standup Resistant tobacco plants, *Nicotiana glutinosa*, *Petunia*, and Grand Rapids tomatoes. The period of potency of the virus under investigation at St. Catharines appears to be only from ½ to 2 hours; it is inactivated by 10 minutes' heating at 45° C. Control should be based on the removal of diseased material and, in the greenhouse, on the extermination of the insect vectors, *Thrips tabaci* and *Frankliniella insularis* [ibid., xiii, p. 190].

Magee (C. J.). **Bacterial canker of Tomatoes.**—*Agric. Gaz. N.S.W.*, xlvi, 4, pp. 192–194, 4 figs., 1935.

A brief, popular account is given of the symptoms, manner of infection, and control of tomato bacterial canker (*Aplanobacter michiganense*), which has recently appeared in New South Wales. The control measures recommended consist in the use of seed from clean crops, or isolated clean parts of the crop, its extraction by fermentation with the pulp, without water, for at least three days [*R.A.M.*, xiii, p. 478], the disinfection of commercial seed [ibid., xiii, p. 403], and improved sanitary methods.

Fish (S.) & Pugsley (A. T.). **Tomato leaf mould recorded in Victoria.**—*J. Dep. Agric. Vict.*, xxxiii, 4, pp. 188–190, 2 figs., 1935.

After stating that tomato leaf mould (*Cladosporium fulvum*) was first noticed in Victoria in the spring of 1934, when it appeared in three glass-houses in different areas, the authors give a brief, popular account of the disease and its control [*R.A.M.*, xiii, p. 496; xiv, p. 202].

GRAVES (A. H.). **Forest pathology.**—*Rep. Brooklyn bot. Gdn, 1934* (*Brooklyn bot. Gdn Rec.*, xxiv, 2), pp. 59–63, 1935.

Further notes are given on the hybrids between certain Japanese and Chinese chestnuts (*Castanea crenata* and *C. mollissima*) and the American (*C. dentata*) made for the purpose of combining the comparative resistance to blight (*Endothia parasitica*) of the former with the desirable timber qualities of the latter [*R.A.M.*, xii, p. 601]. Successful crosses have been made, *inter alia*, between two Smith hybrids (*C. crenata*×*C. dentata*) and *C. dentata*, 12 *C. mollissima* and *C. dentata*, 19 *C. mollissima* var. Mammoth and *C. dentata*, 7 *C. mollissima* and the dwarf Chinese *C. seguinii*, and 4 Japanese forest type (*C. crenata* var.) and *C. dentata*. As far as resistance to blight is concerned, *C. mollissima* has been found to be the finest stock, none of the 15 trees under observation for the past six years having shown a trace of infection. The total of Japanese-American hybrid chestnuts now growing at Hamden is 97.

BOSE (S. R.). **Cytology of secondary spore formation in Ganoderma.**—*Phytopathology*, xxv, 4, pp. 426–429, 2 figs., 1935.

The author has frequently observed in *Ganoderma lucidum* [*R.A.M.*, xiv, p. 532] and *G. applanatum* [ibid., xiv, p. 578] at Calcutta the formation of secondary spores indistinguishable from ordinary basidiospores in shape, size, and spore wall ornamentation [cf. ibid., xii, p. 777]. The same phenomenon, the cytology of which is discussed, was noticed in November and December, 1931, in *Trametes lactinea* and *Polyporus calcuttensis* Bose, and during the abnormally dry spell of August, 1934, in *P. ochroleucus* [ibid., v, p. 452].

SMUCKER (S. J.). **Air currents as a possible carrier of Ceratostomella ulmi.**—*Phytopathology*, xxv, 4, pp. 442–443, 1935.

The results [which are tabulated] of a preliminary experiment with uniformly distributed agar plates in a tightly closed auditorium at one end of which cultures of *Ceratostomella ulmi* [*R.A.M.*, xiv, p. 537] were fanned for five minutes with a small piece of cardboard indicate that the conidia of the fungus may be air-borne to distances of up to 40 ft., this being most readily effected with a five-day-old agar plate culture—though positive results were also obtained with a ten-day-old culture on moist elm blocks and even with a dried one of 24 days on dry elm wood. Control plates exposed in the same room before the fanning test remained sterile. Other trials show that infection may follow the lodging of viable spores in a favourable site, such as a fresh wound in an elm tree.

HIRANE (S.). **Some remarks on the fungus Uromyces hyalosporus Sawada.**—*J. Soc. trop. Agric. Taiwan*, vi, 4, pp. 683–685, 1 fig., 1935.

Uromyces hyalosporus Sawada produces on the phyllodes of *Acacia confusa* in Formosa ruddy-brown, later greenish-yellow, discoid tubercles on which develop successively large numbers of shiny black, punctiform, hemispherical pycnidia, 95 to 150 μ in diameter, containing hyaline, ovoid or ellipsoid pycnospores, 4 to 6 by 3 to 4 μ; dark brown uredosori, 0·3 to 0·8 mm. in diameter, bearing golden-brown, fusiform or long-

ellipsoid, pitted or reticulate, pedicillate, paraphysate uredospores, 32 to 83 by 22 to 33 μ; and watery- to greyish-white teleutosori, velvety at maturity, sometimes intermixed with the uredospores, averaging 0·3 to 1 mm. in diameter and producing ellipsoid to elongated-ellipsoid, hyaline, clavate, smooth-walled teleutospores, 41 to 55 by 16 to 28 μ, furnished with hyaline pedicels, 60 to 120 by 5 to 9 μ, and cylindrical, fusoid to elongated-fusoid paraphyses, 45 to 95 by 16 to 25 μ.

Various important points in the morphology and life-cycle of the rust under discussion are stated to have been omitted from Sawada's original description (*Bot. Mag.*, xvii, p. 16, 1913), necessitating further studies on its systematic position, pending the results of which Dietel's transference of *U. hyalosporus* to the genus *Maravalia* as *M. hyalospora* (Sawada) Diet. (*Ann. Mycol., Berl.*, xxii, p. 269, 1924) should, in the writer's opinion, be provisionally accepted.

HANSBROUGH (J. R.). **A new canker disease of Red Pine caused by Tympanis pinastri.**—*Science*, N.S., lxxxi, 2104, p. 408, 1935.

The silviculturally important red or Norway pine (*Pinus resinosa*) was observed in the winter of 1932–3 to be dying over a small area of the Eli Whitney Forest, New Haven, Connecticut, as a result of cankers caused by *Tympanis pinastri*. The small, black, ovate or spherical pycnidia, and disk-shaped, stalked apothecia of the fungus are stated to be readily overlooked unless they are the object of a special search. It causes elongated cankers, with or without definite margins and with depressed centres, becoming roughened and open after two or three years, round the nodes of the lateral branches, whence they may spread into the stem on the weakening of the host by some environmental factor—the severe drought of 1930 in the case under observation. The fungus has also been found on *P. strobus* trees which were in very poor condition. Positive results were given by inoculations on *P. resinosa* with pure cultures of *T. pinastri* from both hosts. Infection is most prevalent in pure stands of *P. resinosa*, the lower crown classes being much more susceptible than the upper ones.

GRAVES (C. E.). **Controlling fungous sap stains of lumber by use of mercurial fungicide treatments.**—*Agric. News Lett.*, iii, 3, pp. 6–8, 1935. [Mimeographed.]

To prevent blue staining of timber [*Ceratostomella* spp., and other fungi: *R.A.M.*, xiv, p. 275] during the early part of the air-seasoning period the lumber on coming from the saw-mill was until recently treated in America with soda solution (5 per cent. at least, at 150° to 175° F.); the treatment, however, imparted a yellowish colour to the wood and frequently injured the hands of the men. A successful substitute has now been found in ethyl mercury chloride [ibid., xiii, p. 341], which has been so well received that in 1934 the Du Pont Company distributed sufficient to treat about one and a half billion board feet. At the concentration recommended the fluid is non-injurious. It is equally effective against the organisms attacking hardwoods and pine, and both kinds of wood can be dipped in the same vat.

A new compound, LE-5, containing oil-soluble ethyl mercury oleate was also effective against sap-stain fungi. Used in an emulsifiable oil it

can be mixed with water and applied to lumber in the same way as the older treatments. It is also being used as a preservative for cordage.

SCHUMANN (K.). **Bor-Superphosphat und Bor-Am-Sup-Ka gegen Herz- und Trockenfäule der Rüben.** [Boron-superphosphate and bor-am-sup-ka against heart and dry rot of Beets.]—*Dtsch. landw. Pr.*, lxii, 14, p. 171, 1 fig., 1935.

A brief note is given on heart and dry rot of beets and its control in Upper Bavaria by the application of a mixture of boron and superphosphate, with or without the addition of ammonia and potash [cf. *R.A.M.*, xiv, p. 551]. With a well-balanced fertilizer the amount of boron required is stated to be only 5 kg. per 0·34 hect.

SNYDER (W. C.). **St. John's disease of Pea in Europe.**—*Zbl. Bakt.*, Abt. 2, xci, 22–26, pp. 449–459, 2 figs., 1935.

An analysis of the species of *Fusarium* associated with the 'St. John's disease' of peas [*R.A.M.*, xiv, p. 486] found by the author during a survey in 1934 in Central Europe (especially Germany) is fully described. Originally applied to a single disease attributed to *Fusarium vasinfectum* var. *pisi*, the name 'St. John's disease' has come to be used for a complex of pea disorders characterized by the general symptoms of yellowing and premature death. Even diseases due to entirely different causes, such as the *Ascochyta* foot rots [*A. pisi*, *Mycosphaerella pinodes*, and *A. pinodella*: see next abstract] and mosaic or allied conditions of virus origin [ibid., xiv, p. 486], are liable to inclusion under this term.

The following species of *Fusarium* were isolated from peas showing pathological symptoms: *F. redolens*, *F. solani* v. *martii* f. 2, *F. oxysporum* f. 8, *F. herbarum* v. *avenaceum*, and *F. culmorum*. Inoculation experiments showed that the foot and root rot of peas caused by *F. solani* v. *martii* f. 2 is identical with the *Fusarium* root rot of peas caused by this organism in the United States [ibid., xiv, p. 334]; *F. solani* v. *striatum*, described as a virulent parasite of peas in Holland, is considered to be the same fungus. Evidence is adduced to show that the isolations of *F. oxysporum* from diseased peas in Europe (Italy and Germany) agree with *F. oxysporum* f. 8, the agent of 'near wilt' in the United States [ibid., xiv, p. 486]. The name 'St. John's wilt' is used to differentiate this disease from the group usually designated as 'St. John's disease', the former being regarded as identical with 'near wilt'. The American pea wilt (*F. orthoceras* v. *pisi*) has not yet been found in Europe. *F. redolens*, *F. herbarum* v. *avenaceum*, and *F. culmorum* have not yet been adequately tested by the writer for pathogenicity to peas, but the results obtained with them by other workers indicate that, under certain cultural conditions, they may be factors in the causation of disease. *F. redolens* was the species most frequently isolated in Germany.

SPRAGUE (R.). **Ascochyta boltshauseri on Beans in Oregon.**—*Phytopathology*, xxv, 4, pp. 416–420, 1935.

Ascochyta boltshauseri was isolated from snap beans (*Phaseolus vulgaris*) [*R.A.M.*, x, p. 284] in Oregon in September, 1932, this being

apparently the first record of its occurrence in the United States. The mottled grey to buff, flocculent cultures on potato-dextrose agar somewhat resembled those of *A. pisi* from *Vicia villosa* [ibid., ix, p. 273; cf. also xiv, p. 547]. The unpublished results [here briefly discussed and tabulated] of inoculation experiments conducted at Cincinnati, Ohio, from 1926 to 1929 with *A. pisi*, *Mycosphaerella pinodes*, and *A. pinodella* showed that neither *M. pinodes* nor any of the three physiologic forms of *A. pisi* were able to attack *P. vulgaris*, though *P. aconitifolius* and *P. aureus* were slightly susceptible to all three organisms from peas. The [tabulated] data of inoculation tests at Corvallis, Oregon, with the local strain of *A. boltshauseri* show that, of the various Leguminosae used, only *P. vulgaris* (Red Valentine, Boston Navy, and Bush Black Valentine varieties), *P. aureus*, *P. angularis*, and *P. coccineus* were susceptible.

While certain forms of *A. pisi* approximate in spore dimensions to those of *A. boltshauseri* (the spores of which from local material in nature averaged 18 by 4·5 μ for the uniseptate and 21·5 by 5·6 μ for the 15 to 20 per cent. that had 2 to 5 septa), the two differ in the colour of the lesions produced (pale, red-bordered in the former and dark or drab, zonate in the latter). *A. boltshauseri* and *M. pinodes* are considered to be sufficiently distinguished by their wide difference in spore size and divergent host range. *Stagonopsis phaseoli* Eriks., a European bean parasite, appears from a study of the type material to be unquestionably identical with *A. boltshauseri*, the latter name being retained on grounds of priority. The writer has previously adduced evidence for the invalidity of the genus *Stagonosporopsis* [ibid., ix, p. 273], and he is thus of the opinion that the combination *S. hortensis* (Sacc. & Malbr.) Petrak [ibid., i, p. 152] is untenable. *Stagonospora hortensis* Sacc. & Malbr. may be identical with *A. boltshauseri*, but in the absence of type material such a conclusion would be hazardous. *S. phaseoli* Dearness [ibid., viii, p. 66] is characterized by pale, red-bordered lesions and multiseptate spores and is distinct from *A. boltshauseri*.

FAHMY (T.). **The rust of Cowpea. (Part I.) The disease.**—*Bull. Minist. Agric. Egypt* 144, 10 pp., 9 pl., 1935.

In this account of his investigations into cowpea (*Vigna sinensis*) rust (*Uromyces vignae*) [*R.A.M.*, xii, p. 747; xiii, p. 319] in Egypt the author states that Asmerli (the most important local variety) and Baladi are both susceptible to rust and root knot [*Heterodera marioni*], while the third variety grown locally, Hifnawi, is resistant to the former disease but very susceptible to the latter. As the weather cools and the atmospheric humidity increases infection becomes most severe during the period of seed formation between September and October. Heavy infections of susceptible varieties can be avoided by sowing from March to April, but the crops then require longer to mature than later ones and may suffer from other disadvantages.

The minute, round, bright yellow pycnidial spots appear on the leaves, mostly on the upper surface, and to a less extent on the leaf petioles and stems, about July; soon afterwards, clusters of pale yellow aecidia appear in circles, mostly on the lower surface. The dark brown uredosori and still darker (almost black) teleuto pustules follow successively,

occurring on both sides of the leaf. The fungus is stated to be identical with that found on cowpea in Virginia [ibid., iii, p. 566].

WELLMAN (F. L.). **The host range of the southern Celery-mosaic virus.**—*Phytopathology*, xxv, 4, pp. 376–404, 1935.

Inoculation experiments, supplemented by field observations, principally in Florida, have shown that the southern celery mosaic virus (celery virus 1) [*R.A.M.*, xiv, p. 553] can attack at least 91 different hosts, 46 of which were found spontaneously infected under natural conditions. Among the 29 susceptible vegetable crops are White Spine cucumbers, common and strawberry groundcherries (*Physalis pubescens* and *P. alkekengi*), peppers (*Capsicum annuum*), Red Garden beet, spinach, New Zealand spinach (*Tetragonia expansa*), onion, pumpkin (*Cucurbita pepo*), Golden Summer Crookneck and Cocozelle squash (*C. pepo condensa*), Hubbard squash (*C. maxima*), Kleckley Sweet watermelon, West Indian gherkin (*Cucumis anguria*), Florida Highbush and Black Beauty eggplants, Globe and Marglobe tomatoes, and Porto Rico sweet potatoes (also in Cuba). Among the vegetables failing to contract infection by southern celery mosaic were cabbage, mustard, and other crucifers, garden beans (*Phaseolus vulgaris*), peas, lettuce, endive, and Irish potato.

The 23 ornamental hosts include Aztec and French marigolds (*Tagetes erecta* and *T. patula*), *Emilia sagittata*, geranium (*Pelargonium hortorum* Bailey), larkspur (*Delphinium consolida* L.), Golden and Easter lilies (*Lilium auratum* and *L. longiflorum*), *Antirrhinum majus*, Madagascar periwinkle (*Vinca rosea*), *Petunia hybrida*, and *Zinnia elegans*. The following are among the 14 susceptible weeds that may be of considerable importance in the spread of the disease: *Geranium carolinianum*, *Physalis* spp., *Ambrosia artemisifolia*, *Commelina nudiflora*, and *C. communis*. Twenty-five miscellaneous plants were also found liable to infection, including broad bean (*Vicia faba*), banana, maize, sorghum, wheat, rye, *Euchlaena mexicana*, and tobacco.

The symptoms resulting from inoculation with the virus were extremely variable. In many cases primary lesions developed both from aphid transmission and inoculation by rubbing, whereas in others only one of these two methods produced the same effects (the former, for instance, in *Chenopodium murale* and the latter in maize). Certain hosts, e.g., spinach, *D. consolida*, squash, celery, watermelon, banana, maize, tomato, tobacco, and *Antirrhinum majus*, developed severe forms of necrosis, discoloration, or distortion; in others infection was mild or was overcome by the shedding of diseased leaves, as in *Datura* spp.; while in one or two cases—eggplant occasionally and *Emilia sagittata* apparently consistently—the symptoms were entirely masked.

WOOD (F. C.). **A new disease of cultivated Mushrooms.**—*Gdnrs' Chron.*, xcvii, 2520, pp. 243–244, 1 fig., 1935.

This is a more technical note on the disease of cultivated mushrooms in England caused by a fungus determined by H. W. Wollenweber as *Fusarium solani* var. *martii* [previously referred to as *F. solani*] a popular account of which has already been noticed [*R.A.M.*, xiv, p. 346]. Positive results were given by inoculation experiments on healthy

mushrooms with spore suspensions of the fungus, which was reisolated from the infected stipes.

Shear (G. M.). **The growth of Agaricus campestris on plots treated with sodium chlorate.**—*Phytopathology,* xxv, 4, pp. 440–442, 1935.

At the first count on 3rd August, 1934, there were over six times as many mushrooms (*Agaricus* [*Psalliota*] *campestris*) on 30 plots in Virginia treated on 1st June with sodium chlorate (1·5 lb. per gall. water on 100 sq. ft.) against weeds as on the same number of untreated ones, while on the 16th the former bore more than four times the number on the latter. The most plausible explanation of this augmented production on the treated areas is considered to be lack of competition and consequent increase in available nutrients. Another possible interpretation may be sought in the stimulation of growth due to the decomposition of the chlorate.

Branas (J.) & Bernon (G.). **Contribution à l'étude du court-noué de la Vigne.** [Contribution to the study of court-noué of the Vine.]—*Rev. Path. vég.*, xxii, 1, pp. 19–24, 1935.

The results of the authors' cytological studies (using Ranghiano's technique) of healthy and court-noué vine (Aramon) shoots indicate that the structures in healthy and diseased tissues regarded by Ranghiano as hyphae of a symbiotic fungus [*R.A.M.*, xiii, p. 617] should rather be interpreted as artefacts produced by the precipitation and agglomeration of tannic substances, which are particularly abundant in vine tissues. This view is supported by the fact that in their own tests such bodies were readily stained by the reagents specific to tannic substances.

This investigation suggests the advisability of studying more closely the relationships between the abundance, distribution, and state of tannic substances in vine shoots, and the manifestation of court-noué symptoms, since Ranghiano stated that the endophytic hyphae described by him are particularly abundant in diseased shoots.

Bongini (Virginia). **Intorno ad una infezione di antracnosi della Vite.** [On an infection by Vine anthracnose.]—*Difesa Piante,* xii, 1, pp. 16–21, 1935.

In the summer of 1933, Siebel vines in a small vineyard in Piedmont were severely attacked by anthracnose (*Gloeosporium ampelophagum*) [*R.A.M.*, vii, p. 221; xiii, pp. 75, 148]. At the end of May and during June the young branches, fruit clusters, and leaves showed intense spotting; infection ceased during July and August, but became active again in September, a large number of cankers arrested in various stages of development remaining on the branches throughout the winter. Most of the lesions produced by the autumn attack were isolated and almost punctiform, others were almond-shaped, elongated in the direction of the axis, and showed a median ochraceous crack. In the large lesions, 3 or 4 cm. long, formed by the fusion of several smaller ones, spread of the infection was limited by newly-formed cork barriers which led to the desquamation of the older superficial tissues.

Hyaline, inter- and intracellular hyphae were present in the collenchyma near the affected parts, and in the phloem, xylem, and medullary rays. Sclerotia occurred at the edge of the larger lesions; the smaller lesions contained a few subcutaneous, punctiform, almost spherical, brown-walled, ostiolate loculi 200 μ in diameter by 150 μ high, lined with very thin sterigmata with ellipsoidal, hyaline stylospores, 3 to 5·3 μ in diameter. This pycnidial form (*Mangina ampelina*), observed by Viala and Pacottet in old cultures, is probably identical with that observed by M. R. Goethe in 1878. Since then it has only very occasionally been found in nature. Though of the *Phoma* type it was readily distinguishable macroscopically from *P. vitis* and *P. longispora* in that not more than two or three pycnidia were found in any one lesion, they were not present in all the lesions, and were absent from the largest ones, where the periderm tissue had usually peeled off carrying the pycnidial origins with it. It also differed microscopically from *P. vitis* and *P. longispora* in the shape and dimensions of the stylospores, which in the former are bacillary or ellipsoidal and in the latter much longer and either cylindrical or slightly curved.

Some recommendations for control are given.

WORMALD (H.). **Notes on plant diseases in 1934.**—*Rep. E. Malling Res. Sta. 1934*, pp. 142–147, 1935.

This account of plant diseases investigated at East Malling Research Station, Kent, in 1934 [*R.A.M.*, xiii, p. 681] contains, among others, the following items of interest.

Young Cox's Orange Pippin apple trees on No. II stock growing in various plantations in Essex became affected by a disease which in some cases killed them outright. The stems and branches were blistered, and showed the presence of *Coniothecium chomatosporum* [loc. cit.], but the trouble is considered to be largely of physiological origin.

In two plantations Charles Ross, Rival, Worcester Pearmain, and Grenadier apple trees showed a wilting of the leaves on certain branches, sometimes on isolated spurs, not immediately connected with any lesion. The wood of the affected branches was found to be discoloured down as far as a canker (caused by *Nectria galligena*), which, occasionally, was several feet distant from the affected foliage.

Spotting of pear leaves due to *Septoria piricola* (*Mycosphaerella sentina*) [ibid., xiv, p. 590] was recorded from Dorset; on some leaves more than 100 spots were present, many being confluent.

Myrobolan plums [*Prunus divaricata*] in Sussex showed cankers on the stems and young twigs, accompanied by a leaf spot; the bacterial organism associated with the condition has been isolated [cf. ibid., xiii, p. 710].

Black currant rust (*Cronartium ribicola*) was unusually prevalent, heavy infections occurring towards the end of summer. In one instance, Baldwin bushes were severely attacked while Davison's Eight immediately adjoining showed resistance.

Young fig shoots affected by *Botrytis cinerea* were killed back for about a foot; they bore the fructifications of the fungus towards the lower end of the diseased portion.

NOBLE (R. J.), HYNES (H. J.), MCCLEERY (F. C.), & BIRMINGHAM (W. A.). **Plant diseases recorded in New South Wales.**—*Sci. Bull. Dep. Agric. N.S.W.* 46, 47 pp., 1 map, 1935.

In this valuable publication over 1,260 plant diseases (other than sooty moulds, phanerogamous parasites, and conditions due to climatic agencies) found in New South Wales are listed under their respective hosts, with the date (where known) and locality of the first record. Diseases of major importance are indicated and very brief notes are given on a few of special economic significance; the work is completed by a useful index and a map.

BORG (P.). **Report of the Plant Pathologist.**—*Rep. Insp. Agric. Malta, 1933–34*, pp. 43–46, 1935.

The mis-statement recently issued in an Esthonian publication concerning the presence of potato wart (*Synchytrium endobioticum*) in Malta [*R.A.M.*, xiii, p. 799] may, it is thought, have been based on the interception and destruction in 1894 of consignments of seed potatoes reaching Valletta in a badly blighted and semi-rotten condition. Wart disease does not exist and is not known to have existed in the Maltese Islands.

Two reports of root rot (*Armillaria mellea*) on citrus [ibid., xiii, p. 81] were received during the year, 20 fruit trees being also attacked in one of the affected localities. Beneficial results again followed the application of iron sulphate to the roots.

Mild outbreaks of powdery and downy mildews of the vine (*Oidium tuckeri* [*Uncinula necator*] and *Peronospora* [*Plasmopara*] *viticola*) [ibid., ix, p. 158] were also recorded.

WADA (E.) & HUKANO (H.). **On the difference of X-bodies in green and yellow mosaic of Wheat.**—*Agric. & Hort.*, ix, pp. 1778–1790, 6 figs., 1934. (Japanese, with English summary.) [Abs. in *Jap. J. Bot.*, vii, 3–4, p. (64), 1935.]

The microscopic examination of a strip of the leaf epidermis of wheat plants in experimental plots attacked by yellow and green mosaic [*R.A.M.*, ix, p. 581; xii, p. 749] revealed the presence in the diseased tissues of two kinds of X-bodies, one vacuolate, oval or elongated, either larger or smaller than the nucleus of the host cell and occurring singly in each of the latter (A type), and the other homogeneous, oval or irregular, smaller than the foregoing and occurring in groups of two to three or up to five in one cell (B type). A blend of A and B types was observed in the cells of plants affected by both kinds of mosaic.

WATERHOUSE (W. L.). **Australian rust studies. V. On the occurrence of a new physiologic form of Wheat stem rust in New South Wales.** —*Proc. Linn. Soc. N.S.W.*, lx, 1–2, pp. 71–72, 1935.

After briefly referring to his earlier studies of wheat stem [black] rust (*Puccinia graminis tritici*) [*R.A.M.*, xiii, p. 621], the author states that in 1934 wheat from two centres in New South Wales was found to be attacked by form 11, which hitherto has not been recorded from Australia. Controlled work (as yet unpublished) at Sydney has shown

that physiologic form 34 is heterozygous [loc. cit.] and that the virulent form 11 is one of the forms which are frequently derived from it on inoculated barberries in the greenhouse. The recently reported discovery in the Central Tablelands of barberries naturally infected with form 34, which also occurred in the vicinity on graminaceous hosts, indicates the necessity of eradicating susceptible types of barberry. In March, 1935, form 11 was also found mixed with form 34 on *Agropyron scabrum* from the same locality.

CLARK (J. A.) & SMITH (G. S.). **Inheritance of stem-rust reaction in Wheat, II.**—*J. Amer. Soc. Agron.*, xxvii, 5, pp. 400–407, 1935.

The inheritance of three wheat stem [black] rust (*Puccinia graminis tritici*) reactions—near immunity, resistance, and susceptibility—has been further studied in hybrids in North Dakota [*R.A.M.*, xiii, p. 84]. Earlier crosses were interpreted as showing that Hope has a single dominant inhibiting factor for near immunity, Marquis and Reliance a major dominant factor for susceptibility, H–44 carries both these dominant factors, while the resistant Ceres carries the double recessives. Three further crosses between H–44 × Ceres (classified in F_3 as near immune) and the susceptible Marquis are interpreted on the same basis, such variations and inconsistencies as were noted being attributable with equal probability to environment as to additional modifying genetic factors. The rust genotypes of the H–44 × Ceres parents (C–6–1–2, C–6–21–1, and C–10–35–1) are postulated as IIss, resembling Hope; IISS, similar to H–44; and iiss, like Ceres, respectively. The rust reactions in cross No. 1 (IIss × iiSS) are controlled by the interaction of two major genetic factor pairs, the near-immune factor inhibiting that for susceptibility; those of No. 2 (IISS × iiSS) by the one near-immune factor pair; and those of No. 3 (iiss × iiSS) by the one susceptible factor pair. These results are thus in conformity with those obtained in previous studies.

CATALANO-GIAMBRA (ROSA). **Sulla germinazione delle teleutospore delle ruggini del Grano in Sicilia.** [On the germination of the teleutospores of Wheat rusts in Sicily.]—*Riv. Pat. veg.*, xxv, 3–4, pp. 113–116, 1 pl., 1935.

After briefly referring to the view expressed by Montemartini [*R.A.M.*, xiii, p. 18], among others, that the wheat rusts (*Puccinia triticina* and *P. glumarum*) prevalent in Sicily only form teleutospores very rarely and that these do not germinate, the author states that she succeeded in February, 1934, in germinating in hanging drops teleutospores of the rusts collected by her in Sicily in June, 1933, after submitting them to the physico-chemical treatments suggested by Sibilia [ibid., xi, p. 166]. The majority of the teleutospores germinated normally and produced sporidia.

PICHLER (F.). **Über die Verwendbarkeit von Wasserstoffsuperoxyd als Saatgutbeizmittel.** [On the applicability of hydrogen peroxide as a seed-grain disinfectant.]—*Phytopath. Z.*, viii, 3, pp. 245–251, 1935.

A tabulated account is given of the writer's laboratory and field

experiments to determine the utility of hydrogen peroxide for the control of wheat bunt [*Tilletia caries*: *R.A.M.*, xiv, p. 48], covered smut of barley [*Ustilago hordei*], and loose smut of oats [*U. avenae*]. Contrary to the results of Kisser and Portheim, the writer's tests gave no indication of adequate toxicity even at a strength of 3 per cent. (of the 30 per cent. solution) for wheat and barley and of 4 or 5 per cent. for oats.

CORNELI (E.). **Riproduzione in laboratorio di infezioni da 'Urocystis tritici' Koern. su Frumenti.** [Reproduction in the laboratory of infection by *Urocystis tritici* Koern. on Wheats.]—*Riv. Pat. veg.*, xxiv, 9–10, pp. 407–411, 1934. [Received July, 1935.]

Greenhouse tests with seed of Zara, Mentana, Virgilio, Rieti, and Gentil rosso wheat heavily inoculated with spores of *Urocystis tritici* [*R.A.M.*, xii, pp. 681, 751] resulted in 10·24, 2·5, 62·5, 5·0, and 13·15 per cent. infection, respectively. The first symptoms of attack were observed on Virgilio, but on all varieties infection developed within three months of sowing; growth was arrested and the plants gradually wilted and dried up without forming ears. As, under field conditions also (in 1933), Virgilio showed the heaviest, and Mentana the lightest, infection, the author concludes that Mentana, Zara, Rieti, and Gentil rosso are naturally highly resistant and Virgilio susceptible.

No infection was shown by any plant grown in the greenhouse from seed inoculated and then treated with Caffaro powder or copper sulphate solution (1 per cent. for 30 mins.) followed by milk of lime.

RĂDULESCU (E.). **Untersuchungen über die physiologische Spezialisierung bei Flugbrand des Weizens Ustilago tritici (Pers.) Jens.** [Studies on physiologic specialization in loose smut of Wheat *Ustilago tritici* (Pers.) Jens.]—*Phytopath. Z.*, viii, 3, pp. 253–258, 1935.

The results of tests with seven Rumanian collections of loose smut of winter wheat (*Ustilago tritici*) on five standard varieties indicated (unless perhaps the test varieties were too few or not suitable) the absence of physiologic forms of the smut [*R.A.M.*, xiii, p. 621], the hereditary constitution of the varieties grown in Rumania probably not favouring their development. Marked specialization was shown, on the other hand, by eight collections from summer wheat in Rumania and two foreign collections when tested on twelve (seven standard assortment) summer wheat varieties. The eight Rumanian collections fell into three physiologic forms, viz., 1, the most common, from four localities, severely attacking Stephany 71, Saumur de Mars, Peragis, Vesny, and Blue Ribbon but sparing Rimpaus Red Schlanstedt and Hohenheimer 25f; 2, causing moderate to severe infection of Red Schlanstedt, Peragis, and Vesny, slightly attacking Hohenheimer 25f, Saumur de Mars, and Blue Ribbon, and sparing Stephany 71; and 3, from Jassy only, characterized by an extremely low degree of virulence, attacking none of the test varieties and very slightly infecting one other (Ghirca). Of the two foreign strains, that from Halle agrees with Grevel's form 1 [ibid., ix, p. 708], which is apparently absent from Rumania, while the Czecho-Slovakian also differs from the three Rumanian forms, attacking Stephany 71 mildly, Saumur de Mars and

Blue Ribbon moderately to severely, and sparing Red Schlanstedt, Hohenheim 25f, and Peragis; it may be designated as form 4. The Rumanian forms 1, 2, and 3 appear to correspond with Grevel's 2, 3, and 4, respectively. Of the varieties outside the standard assortment used in the trials, Black Persian was remarkable for its high degree of resistance and Rümkers Squarehead for its immunity, both these being suitable for use as parents. Hohenheimer 25f was the most resistant of the standard varieties, Peragis and Saumur de Mars the most susceptible.

GLYNNE (MARY D.). **Incidence of take-all on Wheat and Barley on experimental plots at Woburn.**—*Ann. appl. Biol.*, xxii, 2, pp. 225–235, 1 graph, 1935.

The results of investigations in 1931, 1932, and 1933 into the incidence of the take-all disease (*Ophiobolus graminis*) [see next abstracts] in the continuous wheat and barley growing experiments at the Woburn Experimental Station showed that there was little or no take-all in plots which had received ammonium sulphate alone or in combination with minerals or with 1 to 2 tons lime per acre prior to 1926, since when all the plots, with the exception of some under barley, had remained unmanured. In most of the other plots the disease was present in varying amounts, the percentage infection being usually higher in wheat (reaching 52·5 per cent. in one plot) than in barley (maximum 16·2 per cent.). Little or no take-all occurred either in wheat or barley on soils with a P_H value of 5 or less, comparatively little at 5·1, and in general considerably more at higher values. In wheat the general tendency, in spite of wide variations at the same P_H values, was for the percentage infection to rise as the hydrogen ion concentration decreased, but this was not apparent in barley. A wheat plot which had received applications of rape dust was exceptional in that it showed little infection although it had a P_H value of 5·4, suggesting a possible controlling effect of the dust on take-all. No clear relationship between incidence of the disease and yield of the plots could be established.

The three years' observations suggested that the incidence of take-all in wheat plots increases gradually until 35 per cent. of the plants are infected, from which point it decreases, while two years' observations of barley plots suggested that the corresponding figure for this crop is about 10 per cent. The average loss in yield due to the disease in 13 affected plots rose from 16 per cent. in 1931 to 20 per cent. in 1933, with a maximum of 42 per cent. Take-all was very much less in wheat grown in alternate years with a green manure crop intervening than in continuous wheat plots.

A white mycelium belonging to an Agaric of the *Cortinarius* type was frequently found on the roots and basal parts of wheat and barley. While in general it did not appear to be parasitic, there was some evidence that in certain plots it had become so, causing a loss in yield of 37 per cent.

HYNES (H. J.). **Studies on Helminthosporium root-rot of Wheat and other cereals. Part 1. Economic importance, symptoms and causal organisms. Part 2. Physiologic specialisation in Helminthosporium spp.**—*Sci. Bull. Dep. Agric. N.S.W.* 47, 39 pp., 4 pl., 1 graph, 1935.

The author states that his further studies of the cereal root rot

problem in New South Wales [*R.A.M.*, xi, p. 503] showed that the principal fungi associated with the condition there are *Fusarium culmorum*, *Ophiobolus graminis*, *Rhizoctonia* [*Corticium*] *solani*, and species of *Helminthosporium* including *H. sativum*, *H. tetramera* (but identified by K. B. Boedijn, to whom an isolation was sent, as *Curvularia* [ibid., xiii, p. 475] *spicifera* (Bainier) Boedijn), and *Helminthosporium M* [ibid., iv, p. 408] to which Boedijn has assigned the name *C. ramosa* (Bainier) Boedijn. All these organisms cause appreciable losses in wheat annually, those in 1931 having been estimated at over £362,000. A three-year survey indicated that take-all caused by *O. graminis* is probably more important than foot rot attributed to various species of *Helminthosporium*, but the latter at times also cause a serious wheat seedling blight, resulting in thin stands and reduced yields. A comparative study of the symptoms caused by *O. graminis*, *H. sativum*, and *H. tetramera* on cereals grown from surface-sterilized, inoculated seed in sterilized soil showed that the plants infected with *O. graminis* differed in several characters from those attacked by *Helminthosporium*, the latter exhibiting, *inter alia*, increased tillering and tan discolorations of the stem bases in contrast to reduced tillering and blackish markings in the former. It is suggested that the field symptoms attributed to *Helminthosporium* [ibid., xi, p. 503] are probably the result of the activity of more than one organism.

In the second part of this paper the author describes comparative specialization studies of *H. sativum*, *H.M*, and *H. tetramera*, the results of which showed the existence of 31 physiologic forms of *H. sativum*, 11 of *H.M*, and 5 of *H. tetramera*, differing in their cultural behaviour on potato dextrose, maize meal, and prune juice agars at temperatures of 15° and 25° C. Saltation was observed in certain isolates of each species, especially at 25°. Pathogenicity tests indicated that *H.M*, as a group, is more virulent than either *H. sativum* or *H. tetramera*, although the severity of infection varied considerably in each species, and even within a single physiologic form in the case of *H. sativum* and *H.M*. No correlation was observed between degree of virulence and rate of growth of the organisms in pure culture, and it is suggested that the infection capabilities of a mass collection of cultures cannot be predicted from the behaviour of the organisms on agar media.

PADWICK (G. W.). **Influence of wild and cultivated plants on the multiplication, survival and spread of cereal foot-rotting fungi in the soil.**— *Canad. J. Res.*, xii, 5, pp. 575–589, 1935.

Continuing his studies of the cereal root rot problem in Canada [*R.A.M.*, xii, p. 621], the author gives a brief, tabulated account of pot experiments, in which he shows that susceptible grasses, such as *Agropyron tenerum*, *A. cristatum*, *A. repens*, and *Bromus inermis* tend to promote the survival and accumulation of the take-all fungus (*Ophiobolus graminis*) [see preceding abstracts] in both unsterilized and sterilized soil. These results, supported by field observations, indicate that susceptible species of grasses should be avoided or used sparingly in rotation schemes aiming at the control of take-all, and that summer fallows which do not include a strict eradication of *A. repens* cannot be expected to solve the problem, and may even intensify it. There was

sufficient evidence to show that the same grasses also increased the prevalence of *Helminthosporium sativum* in sterilized soils. The *Agropyron* species did not appear to increase appreciably the incidence of *Fusarium graminearum* [*Gibberella saubinetii*: ibid., xiv, p. 503], but *B. inermis* may be of importance from this standpoint. There is no evidence so far that resistant or immune species actually serve to reduce the quantity of root-rotting fungi in the soil.

The results of further controlled experiments in wooden boxes showed that *O. graminis* was unable to spread laterally to any appreciable extent in bare, unsterilized, black loam soil, but was able to do so to a considerable distance in the presence of living, susceptible plants.

STENING (H. C.). **Effect of 'black point' disease on the germination of Wheat.**—*Agric. Gaz. N.S.W.*, xlvi, 5, p. 282, 1935.

Comparative tests made in New South Wales in three different years of the germinative capacity of healthy wheat grain and that affected by black point [*Helminthosporium sativum* and *Alternaria*: *R.A.M.*, xiii, p. 759], showed that the condition reduced germination by approximately 5½ per cent. The disease has recently been present in nearly all the wheat-growing areas of the State.

AAMODT (O. S.) & JOHNSTON (W. H.). **Reaction of Barley varieties to infection with covered smut (Ustilago hordei [Pers.] K. & S.).**—*Canad. J. Res.*, xii, 5, pp. 590–613, 1 fig., 1935.

After a brief note on the economic importance of barley covered smut (*Ustilago hordei*) in Canada, the authors give a tabulated account of field varietal resistance tests in 1931 (with hulled seed), 1932 (with seed dehulled with sulphuric acid) [*R.A.M.*, xiv, p. 158], and 1934, the last series being performed with seed dehulled by hand (removing the hull over the embryo region with a scalpel), by scarification (rubbing the seed between two sheets of sandpaper of medium coarseness), and by concentrated sulphuric acid. The results, which were analysed by statistical methods, showed that infection of hulled seed was too poor and uncertain to give reliable data on varietal reaction to the disease. All the three dehulling methods gave a significant increase in the amount of resulting smut, the highest infection being given by the hand-dehulled seed and the least by the scarified seed. The average percentage stands of the different varieties tended to be directly proportional to, and the average percentage smut infection inversely proportional to, the amount of hull remaining on the grains following acid treatment. This treatment, as well as scarification, delayed heading by 1½ and 2½ days, respectively, as compared with plants grown from hulled or hand-dehulled seeds, and, moreover, it caused seedling injury to certain varieties. There was a tendency for the later varieties to be more susceptible to the smut than the earlier ones.

The barley varieties tested differed greatly in their reaction to covered smut, but a fair degree of correlation was found between the varietal infection percentages obtained in 1932 with acid-dehulled seed and those obtained in 1934 with hand- or acid-dehulled seed. The experiments indicated that ten six-rowed, hulled types (including O.A.C. 21, Atlas, Sacramento, Glabron, Velvet), three two-rowed, hulled types (Spartan,

Golden Pheasant, Horn), and five hull-less types (Himalayan, New Era, Russian, Mongolian, Burbank) are resistant to the smut, two distinct physiologic forms of which [cf. ibid., iv, p. 214] were found in collections gathered from six centres in central Alberta.

RONSDORF (LISELOTTE). **Weitere Untersuchungen über den Nachweis biologischer Rassen des Gerstenzwergrostes, Puccinia simplex Erikss. et Henn.** [Further investigations on the determination of biologic strains of the Barley dwarf rust, *Puccinia simplex* Erikss. et Henn.]—*Phytopath. Z.*, viii, 3, pp. 237–243, 1935.

Five physiologic forms of dwarf [brown] rust of barley (*Puccinia simplex*) [*P. anomala*] occurring in Germany, viz., II, III, IV, V, and IX, were tested for their behaviour on 15 of the 17 varieties used by Mains as a standard for this purpose in the United States [*R.A.M.*, x, p. 231; xiii, p. 760]. From the results [which are discussed and tabulated] of the experiments it was evident that temperature is an important factor in varietal reaction to *P. anomala*, which on some varieties, e.g., Quinn (resistant), Callas, Peruvian, Bolivia, and Juliaca, tends to be more virulent at 12° than at 22° C., whereas Arequipa and Mecknos Meroc are more resistant at a lower temperature.

The five physiologic forms used in the tests showed very slight differences and behaved like a single on Mains's standard varieties; they were distinct, however, from the two forms already described by him. It would thus have appeared that only three forms of *P. anomala* exist, but by the use of Hey's standard assortment [ibid., xi, p. 36] the five forms were clearly differentiated. The latter is therefore preferable for the determination of physiologic specialization in brown rust of barley. Three monospore cultures of *P. anomala* from the United States were tested on Hey's assortment and shown to differ not only from each other but also from the German forms.

HONECKER (L.). **Weitere Mitteilungen über das Vorkommen biologischer Rassen des Gersten-Meltaues (Erysiphe graminis hordei Marchal), ihre Verbreitung in Deutschland und die sich daraus ergebenden Richtlinien für die Immunitätszüchtung.** [Further notes on the occurrence of biological forms of Barley mildew (*Erysiphe graminis hordei* Marchal), their distribution in Germany, and the lines on which breeding for immunity should be conducted.]—*Züchter*, vii, 5, pp. 113–119, 1935.

After referring to his earlier paper on specialization in barley mildew (*Erysiphe graminis hordei*) [*R.A.M.*, xiv, p. 92] the author briefly describes inoculation experiments in 1934 on three selected standard varieties [loc. cit.], the results of which showed the occurrence in Germany, besides the two physiologic forms A and B previously recorded, of a third form C, characterized by high virulence to the Dalmatian Ragusa variety (which is immune from the other two forms) and to the other two test varieties. So far it has only been isolated from material sent in from the district Irlbach in Bavaria, while the other two forms are widespread over the whole of Germany, B occurring mostly as a slight admixture to A and being most frequent in north, west, and south Germany, Austria, and Rumania. Pathogenicity

tests on a wide range of malting and fodder barley varieties indicated that almost all the varieties immune from form A are highly susceptible to form B, while varieties highly susceptible to both forms A and B exhibit moderate to average susceptibility to form C, the severity of infection by this form depending in a large measure on environmental conditions. Varieties moderately susceptible to forms A and B are also moderately susceptible to form C, with a general tendency for their susceptibility to the last-named to be rather lower than to the other two forms.

The paper terminates with a consideration of the bearing of these results on the possibility of breeding barley varieties resistant to all three forms of *E. g. hordei*.

MURPHY (H. C.). **Effect of crown rust infection on yield and water requirement of Oats.**—*J. agric. Res.*, l, 5, pp. 387–411, 4 figs., 6 graphs, 1935.

This is a full, tabulated account of the author's greenhouse experiments in Iowa in 1928, 1930, and 1933, on the relation of crown rust (*Puccinia coronata avenae*) [*P. lolii*] infection to yield and water requirement of resistant and susceptible oat varieties, a preliminary report of which has been noticed [*R.A.M.*, xiv, p. 353]. In addition to the information already given, the results showed that the effect of the rust on photosynthesis, date of ripening, total yield, and water requirement of both susceptible and resistant plants varied with the degree and type of infection, the stage of growth of the host, and the duration of infection. Apart from reducing the yield of grain [loc. cit.], due to the production of fewer and lighter kernels, and to a higher percentage of hulls in the grain, rust infection also affected root production. In 1930, with 100 per cent. infection, the ratio of roots to straw of the susceptible Markton selection was reduced from 22·8 per cent. for the rust-free plants to 2·8 per cent. for the plants that had been inoculated in the seedling stage, while the corresponding reduction for the resistant Victoria selection was from 31·8 to 16·9 per cent. Susceptible plants inoculated at the same stage used 290·8 per cent. more water per unit of dry weight than rust-free controls, whereas the water requirement of inoculated resistant plants was only increased by 39·9 per cent. In comparative tests it was shown that rust infection tended to have a greater effect on the yield and water requirement of the susceptible plants at the higher than at the lower soil moisture content, while on the nearly immune Bond selection the effect was greater at the lower soil moisture. The lower soil moisture of itself significantly reduced the yield of all plant parts but also decreased the water requirement of both rusted and rust-free plants.

NIEVES (R.). **Infección experimental del Centeno de Petkus (Secale cereale v. vulgare), por las caries del Trigo: Tilletia tritici y Tilletia levis.** [Experimental infection of Petkus Rye (*Secale cereale* v. *vulgare*) by the Wheat bunts: *Tilletia tritici* and *Tilletia levis*.]—*Phytopathology*, xxv, 5, pp. 503–515, 1935. [English summary.]

During the years 1931–3 the writer successfully inoculated Petkus rye with certain physiologic forms of wheat bunt (*Tilletia tritici* and

T. levis) [*T. caries* and *T. foetens*] collected from various parts of Argentina [*R.A.M.*, xii, p. 683], where the rare *T. secalis* [ibid., xii, pp. 549, 616] does not appear to occur.

The seed-grain was dusted shortly before planting with the spores of the particular bunt collection under investigation. In 1931–2 six collections of *T. caries* and two of *T. foetens* were used and the sowings were made on 23rd April and 20th July. From the first, 68 infected spikelets were found among a total of 6,761 (about 1 per cent.), the corresponding figures for the second sowing being only 2 out of 8,667 (0·02 per cent.). Three of the collections of *T. caries* and one of *T. foetens* produced infection. In 1932–3, 18 collections of the former species and 6 of the latter were used, the seed being sown on 27th April. Forty-nine diseased spikelets were found among 23,780 examined (0·22 per cent.), the average infection for the two years being 0·3 per cent. (119 diseased spikelets out of 39,208). Four collections of *T. caries* and three of *T. foetens* gave positive results. In 1933–4, 43 collections of *Tilletia*, all indigenous except one from Germany, were tested with positive results (awaiting further confirmation) on 11 different hosts.

As a result of tests of the various bunt strains on differential wheat varieties 9 physiologic forms of *T. caries* (I to IX) and 4 of *T. foetens* (I to IV) have been established [ibid., xiii, pp. 85, 86, 359] for the Argentine, of which only 3 of the former (II, V, and IX) and all the latter were pathogenic to rye.

HOPKINS (J. C.). **Suspected 'streak' disease of Maize. Notice to growers.** —*Rhod. agric. J.*, xxxii, 4, pp. 234–236, 1 pl., 1935.

Maize in Rhodesia is reported recently to have become affected with a disease closely resembling streak [*R.A.M.*, xiv, p. 146]. The symptoms of streak disease are described, and growers are asked to send specimens and reports to the author, in order that the distribution of the condition in the Colony may be ascertained. Experiments in insect transmission are in progress.

RHOADES (VIRGINIA H.). **The location of a gene for disease resistance in Maize.**—*Proc. nat. Acad. Sci., Wash.*, xxi, 5, pp. 243–246, 1 fig., 1935.

Particulars are given of a study on the chromosomal location in maize of the factor for resistance to physiologic form 3 of *Puccinia sorghi* [*P. maydis*: *R.A.M.*, xi, p. 170], which was cytologically determined by means of X-ray-induced deficiencies (Barbara McClintock's method described in *Bull. Mo. agric. Exp. Sta.* 163, 1931) and genetically checked by means of trisomic ratios.

Pollen from a plant homozygous for the dominant factor for resistance was treated with X-rays (1,000 or 2,000 *r* units) and then used to pollinate susceptible plants. The seed thus obtained was grown in the greenhouse during the winter, the resultant F_1 seedlings inoculated with the rust, and the susceptible individuals (which were readily distinguishable by their reactions from the resistant ones) cytologically examined at the mid-prophase of meiosis. The results of this examination, supplemented by those of a genetic study of trisomic ratios [which are tabulated], indicate that the factor for resistance to *P. maydis* form 3 is

situated in the short arm of the tenth and shortest chromosome of the haploid maize complement.

BRITON-JONES (H. R.) & BAKER (R. E. D.). **Control of Grapefruit diseases by cultural methods in Trinidad.**—*Trop. Agriculture, Trin.*, xii, 5, pp. 119–125, 4 pl., 1935.

In this paper, the purpose of which is to inform planters as to the best means of avoiding disease in new plantations of grapefruit, the authors give brief notes on the environmental conditions that favour the development of parasitic and other troubles in Trinidad, namely, damping-off of seedlings due, presumably, to various fungi, among which *Phytophthora parasitica* was identified in one case; scab (*Sporotrichum citri*) [*R.A.M.*, xiii, p. 219]; gummosis (*P. parasitica* and *P. palmivora*) [ibid., xiv, p. 505]; root rot, the causal organism of which has not been discovered so far; threadblights (*Corticium stevensii* and as yet unidentified Marasmioid forms) [ibid., xiii, p. 540]; *Septobasidium* sp. believed to be probably *S. pseudopedicillatum* [loc. cit.]; and pink disease (*C. salmonicolor*): the three last-named diseases are of minor importance.

WEBBER (IRMA E.) & FAWCETT (H. S.). **Comparative histology of healthy and psorosis-affected tissues of Citrus sinensis.**—*Hilgardia*, ix, 2, pp. 71–93, 7 pl., 1935.

This is a full account of the authors' comparative studies of the tissues of healthy and of psorosis-affected orange trees [*R.A.M.*, xiii, p. 692], the results of which showed that the first symptom of the disease in the stem is an abnormal darkening of the parenchyma cell contents in the cortex; this is followed by the formation of an underlying phellogen layer which differentiates cork centrifugally and phelloderm centripetally. The phelloderm thus produced is much more abundant than that laid down in healthy stems, and at times contains radially arranged groups of small stone cells. This process results in the formation of small macroscopically visible eruptions on the surface of the bark, and as the disease progresses it involves further groups of parenchyma cells deeper down in the cortex. In time the tissues over the abnormal cork slough off in scales, which are the most conspicuous symptom of the trouble. Diseased xylem is characterized by concentric rings or partial rings of vertical gum ducts and by scattered vessels plugged with gum, which also occurs occasionally in gum pockets in the abnormally thick phelloderm. Gum is often visible externally on affected stems.

Psorosis-affected leaves, in which the mesophyll is not yet completely differentiated, exhibit a mosaic-like effect [loc. cit.] due to small light-coloured areas in the lamina; the tissues of such leaves differ from those of normal leaves in their staining reactions, and sections through the irregular, discoloured, and corky areas, which often appear on mature diseased leaves, show an abnormal darkening of epidermal and occasionally mesophyll cells, under which a cork layer is formed.

The results of these studies, which failed to reveal any visible causal organism, tend to confirm Fawcett's suggestion [loc. cit.] that psorosis may be caused by a virus. There was some evidence that the development of the disease may be accelerated by environmental conditions.

REED (H. S.) & DUFRÉNOY (J.). **The effects of zinc and iron salts on the cell structure of mottled Orange leaves.**—*Hilgardia*, ix, 2, pp. 113–137, 2 col. pl., 11 figs., 1935.

Continuing their studies of the mottle leaf disease of citrus [*R.A.M.*, xiv, p. 506] the authors give details of experiments, the results of which showed that the recovery of mottled trees after the application of zinc salts either through the soil or as a foliage spray is associated with profound cytological changes, the beneficial effects being especially striking in old depauperate leaves sprayed with a solution of zinc sulphate. Neither calcium deficiency nor phloem necrosis is exhibited by the green leaves that develop on shoots produced after treatment, and their chloroplasts develop to a fair size. The action of iron salts, on the other hand, appeared to be negligible.

The investigation also indicated that definite information as to the distribution of iron and zinc in leaves and buds may be obtained by a combination of micro-incineration and micro-analysis, and there was further evidence to support the view that zinc is intimately concerned with the oxidation-reduction potential of the cell [ibid., xiv, p. 302].

HAAS (A. R. C.) & QUAYLE (H. J.). **Copper content of Citrus leaves and fruit in relation to exanthema and fumigation injury.**—*Hilgardia*, ix, 3, pp. 143–174, 9 figs., 1935.

The results of the investigation reported in considerable detail in this paper showed that the leaves of citrus trees affected with exanthema [*R.A.M.*, xi, p. 105] have a lower copper content than normal, and that the same is probably also true of the fruit. By means of controlled sand cultures it was further shown that the disease appears in soils deficient in copper.

ROBSON (G.). **Mould wastage in Citrus fruits.**—*Food Manuf.*, x, 5, pp. 159–161, 7 figs., 1935.

In this paper on the etiology and control of mould spoilage in citrus fruits promising results are stated to have been obtained in California with 'agene' (nitrogen trichloride) gas [*R.A.M.*, xiv, p. 163] as a means of combating *Penicillium digitatum*, *P. italicum*, *Phytophthora citrophthora* (mycelium), *Colletotrichum gloeosporioides*, and *Alternaria citri*. The gas is ordinarily effective at a concentration of 4 to 6 mg. per cu. ft. for 30 minutes, but at this low strength it is not lethal to large clumps of mycelium. During eight to ten weeks' storage, decay in oranges may be reduced by 50 to 75 per cent. by fumigation with nitrogen trichloride at 15 mg. per cu. ft. Three to five three-hour treatments at three- to four-day intervals should be given. For commercial purposes it is advisable to prolong the first treatment to six hours to ensure penetration to the centre of the box, and to maintain the fungicidal action for a sufficiently lengthy period.

NEAL (D. C.) & GILBERT (W. W.). **Cotton diseases and methods of control.**—*Fmrs' Bull. U.S. Dep. Agric.* 1745, 34 pp., 27 figs., 1935.

After stating that their observations lead them to believe that disease reduces the American cotton crop by over two million bales a year, the

authors give brief, popular notes on the symptoms, cause, and control of the following major diseases of this host found in the United States: root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xiv, pp. 304, 443], wilt (*Fusarium vasinfectum*) [ibid., xiii, p. 766; xiv, p. 359], *Verticillium* wilt (*V. albo-atrum*) [ibid., xiii, p. 632], anthracnose (*Glomerella gossypii*) [ibid., x, p. 240; xiii, p. 804], bacterial blight (*Bacterium malvacearum*) [ibid., xiv, p. 304], potash hunger or 'rust' [ibid., xiii, p. 698], crazy top or acromania [ibid., vii, p. 96], associated with unsatisfactory soil and cultural conditions, magnesium deficiency, sore shin (*Corticium solani*) [ibid., xii, p. 566], *Ascochyta* blight (*A. gossypii*) [ibid., ix, p. 240], and lightning injury. The minor diseases dealt with include leaf blight (*Alternaria* sp.) [ibid., xi, p. 225], *Cercospora* leaf spot (*C. gossypina*) [ibid., ix, p. 32], areolate mildew (*Ramularia* [*Mycosphaerella*] *areola*) [ibid., xi, p. 512], the boll rots due to *Diplodia gossypina* [ibid., x, p. 240; xii, p. 366], *Fusarium* spp., chiefly *F. roseum* and *F. moniliforme* [*Gibberella moniliformis*: ibid., xi, p. 453], *Aspergillus niger*, and *Rhizopus nigricans*, and true rusts caused by *Kuehneola gossypii* [*Cerotelium desmium*: ibid., xi, p. 475] and *Puccinia hibisciata* (*P. schedonnardi*) [ibid., xiv, p. 348]; the former rust, found in Cuba, Porto Rico, and (once) in Florida, causes slightly raised, rust-brown, circular, pinhead spots on the leaves, whereas the latter, which occurs to a limited extent in Texas, Arizona, New Mexico, and southern California, produces larger, raised, orange-coloured spots on the leaves, bolls, and involucral bracts.

VIEGAS (A. P.) & KRUG (H. P.). **A murcha do Algodoeiro.** [Cotton wilt.] —*Rev. Agric. S. Paulo*, x, 1–2, pp. 49–51, 3 figs., 1935.

This is a very brief account of the cotton wilt caused by *Verticillium albo-atrum* [see preceding abstract], which was found in 1933 occurring in considerable abundance in several centres of São Paulo, Brazil, causing appreciable economic losses to the crop. Work is in hand to test the possibility of controlling the disease by growing resistant cotton varieties.

BOCZKOWSKA (MARIE). **Contribution à l'étude de l'immunité chez les chenilles de Galleria mellonella L. contre les champignons entomophytes.** [A contribution to the study of immunity in larvae of *Galleria mellonella* L. from attack by entomogenous fungi.]—*C.R. Soc. Biol., Paris*, cxix, 16, pp. 39–40, 1935.

When wax-moth (*Galleria mellonella*) larvae were infected by entomogenous fungi (the most virulent of which were *Beauveria bassiana* [*R.A.M.*, xiv, p. 444] and *Metarrhizium anisopliae* [ibid., xiii, p. 94]) in many instances black spots consisting of agglomerated leucocytes formed on the chitin, the hypoderma became detached and degenerated, and blood passed between it and the chitin, the blood cells forming a sort of abscess in the space left by the hypoderma under the chitin. In severe infections the black chitin ruptured and the fungus penetrated the tissues. The blood reacted to infection by the formation of giant cells; the fungi escaped intracellular digestion by the leucocytes owing to their rapid growth.

Injections of spore emulsions were more rapidly fatal than external inoculations with the same emulsions, while the latter method caused

infection more rapidly than dusting with dried spores. Negative results have so far been obtained from attempts to induce immunity.

MARCHIONATTO (J. B.). **Argentine Republic: fungous parasites of scale insects of fruit trees.**—*Int. Bull. Pl. Prot.*, ix, 5, pp. 102–103, 1935.

Notes are given on some important fungal parasites of scale insects infesting fruit trees in Argentina, all of which have been mentioned in a recent list [*R.A.M.*, xiv, p. 98] with the exception of *Septobasidium albidum* [ibid., xiii, p. 90] on the citrus pest, *Lepidosaphes beckii*.

LÉGER (L.) & GAUTHIER (MARCELLE). **La spore des Harpellacées (Léger et Duboscq), champignons parasites des insectes.** [The spore of the Harpellaceae (Léger & Duboscq), fungi parasitic on insects.] —*C.R. Acad. Sci., Paris*, cc, 17, pp. 1458–1460, 1935.

The spores of the Harpellaceae [*R.A.M.*, xii, p. 511] (a term considered preferable to 'conidia' in the present state of knowledge of this group) are stated to be uniformly exogenous, thick walled, transparent, refringent, and of a fair size (30 to 50 μ); they are acrogenous, ordinarily unilateral, and their growth rate increases parallel with their proximity to the apex of the axis or branch on which they are borne. The shape of the spores varies with the genera, the most common being the ovoid-elongated, more or less swollen type characteristic of *Stachylina* and *Genistella*; those of *Stipella* and *Typhella* (a new genus parasitic on Chironomid larvae to be described in the near future) are tubular, rectilinear, or slightly curved, 38 by 5 μ; in *Orphella* they are banana- and in *Harpella* crescent-shaped. On detachment from their axes the helical filaments attached to the spores uncoil and reach remarkable lengths—up to six times that of the spores themselves (in *G. ramosa*). The function of these remarkable appendages is obscure, but since they are not generally present in the spores occurring freely in the intestines of the hosts, they are evidently short-lived.

NOBINDRO (U.). **Grass poisoning among cattle and goats in Assam.**—*Indian vet. J.*, x, 3, pp. 235–236, 1934.

During July and August 1932, cattle and goats in Assam were affected by symptoms indistinguishable from those of ergot poisoning (*Claviceps*) [*purpurea*]. Search of the grazing fields revealed the presence of a species of *Balansia* in abundance on lovethorns grass [?*Andropogon aciculatus*] and the trouble is attributed to poisoning from this fungus. A good number of cattle and goats are said to die from this cause every year in India.

REDAELLI (P.). **La moderna sistemazione delle cosidette 'blastomicosi'.** [The modern taxonomy of the so-called 'blastomycoses'.]—*G. ital. Derm. Sif.*, lxxvi, 2, pp. 253–281, 5 pl., 1935.

Following some general observations on the classification of human mycoses and a consideration of the significance of the terms 'blastomycetes' and 'blastomycoses', the use of which is deprecated as misleading, the writer passes in review the various schemes proposed for the subdivision of this heterogeneous group of human pathogens. The conclusion is reached that the separation of the latter into etiologically,

clinically, and anatomically well-defined forms is essential. On this basis ten types of disease are differentiated, viz. (1) rhinosporidial granuloma (*Rhinosporidium seeberi*) [*R.A.M.*, xiv, p. 446]; (2) coccidioidal granuloma (*Coccidioides immitis*) [ibid., xiv, p. 445]; (3) paracoccidioidal granuloma (*Paracoccidioides brasiliensis*) [ibid., xiv, p. 169]; (4) chromomycotic verrucose dermatitis (*Trichosporium pedrosoi*) [ibid., xiv, p. 509]; (5) Gilchrist's syndrome or mycotic verrucose dermatitis (*Gilchristia dermatitidis*) [ibid., xiv, p. 582]; (6) Darling's disease (*Histoplasma capsulatum*) [or *Posadasia capsulata*: ibid., xiv, p. 583]; (7) epizootic lymphangitis (*H. farcinimosum*) [*Cryptococcus farcinimosus*: loc. cit.]; (8) splenomegaly of rats (*H.* [*C.*] *muris*) [loc. cit.]; (9) highly variable forms, including ringworms (*Trichophyton* and other fungi) and the superficial or internal disturbances associated with *Candida* and other genera; and (10) miscellaneous pathological conditions not assignable to any of the preceding categories and requiring individual examination.

Sartory (A.), Sartory (R.), Meyer (J.), & Weiss (R.). **Étude d'un champignon levuriforme nouveau isolé d'une dermatomycose tropicale.** [A study of a new yeast-like fungus isolated from a tropical dermatomycosis.]—*Bull. Acad. Méd. Paris*, cxiii, 15, pp. 486–488, 1935.

From the squamae of superficial, circinate, localized lesions on negro patients at Dr. A. Schweitzer's hospital, Lambaréné (French Equatorial Africa), the writers isolated a species (believed to be new to science) of *Blastodendrion* [*R.A.M.*, xiii, p. 767] to which the name *B. schweitzeri* n.sp. is given [without a diagnosis].

The colonies formed by the organism on various standard solid media are of a smooth, creamy consistency, readily detachable from the substratum, and yellowish-white in colour (turning brown after a month on Sabouraud's malt agar only). The optimum temperature for growth was found to be 27° to 28° C. Among liquid media, peptonized water proved the most satisfactory. Milk was coagulated in four days and peptonized in nine. The 'veil' formed on peptonized water was found to consist of a very loosely woven mycelium with stalagmoid, very occasionally verticillate blastospores, 12 to 16 by 4 to 6 μ. Positive results were given by inoculation experiments on guinea-pigs.

Downing (J. G.) & Hazard (J. B.). **Cutaneous moniliasis associated with oral thrush. An unusual case.**—*Arch. Derm. Syph., Chicago*, xxxi, 5, pp. 636–643, 3 figs., 1935.

Clinical particulars are given of a case of cutaneous moniliasis associated with oral thrush in a 15-year-old white boy at the Boston City Hospital. The organisms isolated on Sabouraud's maltose agar and plain bouillon at 37·5° C. from the lesions of the mouth and face were yeast-like, with round to oval cells, 5 to 10 μ in diameter, septate hyphae, and oval conidia, 2 to 5 μ in diameter. After seven days' incubation at room temperature a typical inverted 'pine tree' mycelium developed, the long hyphae bearing at regular intervals spherical clusters of 20 to 30 conidia. The colonies were round, slightly conical, smooth, and ivory-white. The fungus is considered to be allied to

Monilia [*Candida*] *albicans* [*R.A.M.*, xiv, p. 444], which is not usually present on normal skin. Inoculation experiments on rabbits gave positive results.

WIEDER (L. M.). **Fungistatic and fungicidal effects of two wood-preserving chemicals on human dermatophytes: ortho (2 chlorophenyl) phenol sodium and tetrachlorphenol sodium.**—*Arch. Derm. Syph., Chicago*, xxxi, 5, pp. 644–657, 1935.

Full particulars, accompanied by tables, are given of the methods and results of the writer's experiments in the control of the dermatophytes, *Trichophyton interdigitale* (five strains), *T. gypseum granulosum* [*R.A.M.*, x, p. 29], *Sporotrichum schenckii* [ibid., xiv, p. 36], and *Monilia* [*Candida*] *albicans* [see preceding abstract] by the wood preservatives, sodium-2-chloroorthophenylphenolate and sodium tetrachlorophenolate [ibid., xii, p. 668]. Both in dextrose broth and Sabouraud's agar cultures in the laboratory and in subsequent clinical practice the latter proved the more effective of the two, exerting a definite action on the superficial forms of dermatophytosis when applied as an ointment at a strength of 1 per cent. by weight.

MOORE (M.) & KILE (R. L.). **Generalized, subcutaneous, gummatous, ulcerating sporotrichosis: report of a case with a study of the etiologic agent.**—*Arch. Derm. Syph., Chicago*, xxxi, 5, pp. 672–685, 6 figs., 1935.

An account is given of a case of generalized sporotrichosis in a 50-year-old white woman, associated with an organism characterized in the tissues by short, rod-like, blunt cells, 2 to 5 by 1 to 3 μ, or ovoid cells, and in culture by hyphae, 1 to 5 μ in diameter, producing laterally or terminally, singly or in groups, numerous spherical, ovoid or piriform, pediculate or sessile conidia, 2 to 6 by 2 to 4 μ. On Sabouraud's dextrose and wort agar at 37·5° C. the typical colonies of *Sporotrichum* developed, the species involved being apparently *S. beurmanni* [*R.A.M.*, xiv, p. 309], considered by the writers to be doubtfully distinct from *S. schenckii* [see preceding abstract]. The cultural characters of the fungus on these and 15 other media are described. The organism was shown by inoculation tests to be pathogenic to laboratory animals.

MILOCHEVITCH (S.). **Contribution à l'étude du Trichophyton rubrum.** [Contribution to the study of *Trichophyton rubrum*.]—*Ann. Parasit. hum. comp.*, xiii, 3, pp. 253–258, 1 pl., 1935.

From a case of sycosis of the beard in Jugo-Slavia in 1930 the author isolated a strain of *Trichophyton rubrum* corresponding to the *lanoroseum* type of Ota and Kawatsuré [*R.A.M.*, xiii, p. 303]. On natural media this strain produced all the morphological features typical of *Trichophyton*, namely, simple and composite clusters of spores, typical club-shaped spindles, perfect 'vrilles' [terminal spirals] with several convolutions, and pyriform aleuria.

CH'IN (T. L.). **A mycological study of a case of otomycosis.**—*Chinese med. J.*, xlix, 4, pp. 346–349, 1 pl., 1935.

From the cerumen in the auditory canal of a young Chinese male the writer isolated on Sabouraud's glucose agar and other media a

fungus identified as *Aspergillus candidus* [*R.A.M.*, xi, p. 20], apparently not hitherto recorded as an agent of otomycosis [cf. ibid., xiii, p. 577], of which this also appears to be the first case reported in China.

KAESS (G.) & SCHWARTZ (W.). **Über das Wachstum von Schimmelpilzen bei hoher relativer Luftfeuchtigkeit.** [On mould growth at high relative atmospheric humidity.]—*Arch. Mikrobiol.*, vi, 2, pp. 208–214, 5 graphs, 1935.

Two methods [details of which are given] were used to investigate the growth of *Penicillium flavo-glaucum* [an agent of putrefaction in meat: *R.A.M.*, xiii, pp. 702] at high relative atmospheric humidities and low osmotic pressures. The results of the experiments, which agreed completely by both methods, showed that the mould makes the best growth at a relative atmospheric humidity of 99·35 per cent., corresponding to an osmotic pressure of roughly 8·0 atmospheres in the nutrient medium.

WOOD (F. W.) & THORNTON (H. R.). **The microbiology of butter. I. The yeast and mold count of butter as a measure of creamery sanitation.**—*Canad. J. Res.*, xii, 3, pp. 286–294, 1935.

The results of the investigation reported in this paper indicated that plate counts of yeasts and moulds contained in butter [*R.A.M.*, xiii, p. 580], a method which is extensively used in Canada, are not sufficient as a measure of the sanitary condition of creameries, and should be supplemented by simultaneous bacterial counts. In the samples tested the only relation observed between the different kinds of microorganisms in butter was that high yeast counts tended to occur in butter with a high bacterial content. Pasteurization of cream was found to destroy the fungi but not all the bacteria, and butter manufactured in churns with external butter workers was characterized by a high yeast and mycoderm [ibid., xiii, p. 97] count.

THORNTON (H. R.) & WOOD (F. W.). **The microbiology of butter. II. The growth of molds in and upon butter.**—*Canad. J. Res.*, xii, 3, pp. 295–305, 1935.

Continuing their microbiological studies of butter in Canada [see preceding abstract], the authors distinguish surface (frequent) and interior (rare) moulding of butter, the latter occurring as smudgy, dark areas or patches throughout the interior mass and usually resulting in almost complete loss of the butter. The results of their investigations suggest that the growth of the moulds is not initiated in the moisture incorporated in the butter, but probably in condensation moisture on the various surfaces of butter, since samples moulded freely at ice-box temperatures in the presence of high atmospheric humidity but not when humidity was low. No relation was found between the mould count of butter and the subsequent development of mouldiness. Of the four treatments tested for the prevention of mould on packed butter, the best protection was given by parchment wrappers soaked in hot or cold saturated brine. A species of *Cladosporium* [*R.A.M.*, xiii, p. 443] was isolated from mouldy patches in butter showing interior moulding.

Beresova (Mme E.) & Savtchenkova (Mme M.). Бактериальные болезни Льна. [Bacterial diseases of Flax.]—*Микробиол.* [*Microbiol.*], iv, 1, pp. 103–120, 10 figs., 1 diag., 1935. [English summary.]

Three groups of bacterial diseases of flax have been differentiated at the U.S.S.R. Flax Institute, viz. (1) those attacking the plant itself, (2) those reducing seed germination, and (3) those inducing physiological changes in the root system without visibly affecting the tissues.

The organisms comprising group (1) are butyric acid-forming, sporing rods, facultative anaerobes, causing acetone-ethylic fermentation of carbohydrates and assimilating nitrogen in mineral (ammonium sulphate) and organic (peptone) forms. The pathogenicity of the bacteria was demonstrated by a series of laboratory and field experiments [a fully tabulated account of which is given]. Two types of lesions have been observed, one involving injury to the roots and occurring on all kinds of soil, and the other, manifested by stunting of the root system and dying-off of the growing-point, which is confined to virgin soils. Bacteria diminish the yield of straw by 40 per cent. and of seed by 18 per cent. Under favourable conditions of plant growth a new root system may be formed and the dead stem replaced. Individual strains of bacteria show variations in virulence, and some reduce the yield on rich, dark-coloured soils as heavily as on poor, sandy loams, though the general tendency is for the latter to be most affected.

Further studies are required in the case of the seed bacterioses, causing a loss of germination of 28 per cent., and also on those responsible for physiological changes in the root system and reducing the yield by 15 to 20 per cent.

Bacterial infection of flax appears to be largely controllable by proper tillage on virgin soil and the use of suitable fertilizers.

Kikuchi (M.). **Physiological studies on a wilt-resistant strain of Flax with special reference to the effect of soil condition.**—*Proc. Crop Sci. Soc. Japan*, vi, pp. 259–279, 1 pl., 4 figs., 1934. (Japanese, with English summary.) [Abs. in *Jap. J. Bot.*, vii, 3–4, p. (45), 1935.]

A selection of the Riga strain of flax highly resistant to wilt (*Fusarium lini*) [*R.A.M.*, xiv, p. 362] showed an incidence of only 0 and 2·1 per cent. infection at low and high soil moistures, respectively, the corresponding figures for the original strain being 68 and 42 per cent. The optimum temperature [for infection of the Riga selection by *F. lini*] was found to lie between 25° and 30° C. One of the factors contributing to the wilt resistance of the new strain may be the high osmotic strength of the epidermal or subepidermal cotyledonary cells, as gauged by the action of a 0·3 to 0·5 mol. sugar solution.

Müller (A. S.). **Brazil: preliminary list of diseases of ornamental plants in the State of Minas Geraes.**—*Int. Bull. Pl. Prot.*, ix, 5, pp. 104–105, 1935.

A list is given of some well-known fungous diseases affecting ornamental plants in Brazil, where mosaic is also reported on dahlias [*R.A.M.*, xiii, pp. 355, 492], *Gladiolus* sp. [ibid., ix, p. 628], and lilies [ibid., xiii, p. 379].

Smith (K. M.). **A virus disease of Primula obconica and related plants.**—*Ann. appl. Biol.*, xxii, 2, pp. 236–238, 1 pl., 1935.

A brief description is given of a virus disease which was found by D. E. Green attacking a *Primula obconica* plant grown at Wisley, Surrey, in a frame with young vegetable marrows. The disease was successfully transmitted by inoculation to young plants of *P. sinensis*, the resulting symptoms being very similar to those on the *P. obconica* plant and to a number of Solanaceous plants, including *Nicotiana glutinosa* and White Burley tobacco, the symptoms on which were very reminiscent of those produced by cucumber virus 1 [*R.A.M.*, xiv, p. 554] in comparative inoculation tests. Furthermore, both viruses produced similar local lesions on cowpea (*Vigna sinensis*) leaves, and their longevity *in vitro* was less than 96 hours. These results suggest that the *P. obconica* virus is a strain of cucumber mosaic [cf. ibid., xi, p. 797].

Verona (O.). **Di una batteriosi dell' 'Aster chinensis' L.: 'Bac. asteris', n.sp.** [A bacteriosis of *Aster chinensis* L.: '*Bacillus asteris*' n.sp.]—*Riv. Pat. veg.*, xxv, 1–2, pp. 15–24, 1 pl., 1935.

In June 1934 the author examined severely wilted asters (*Aster chinensis*) [*Callistephus hortensis*] growing in a nursery at Leghorn, where the disease had practically killed off all the early varieties and a large part of the late ones. The roots of the affected plants were normal, but the aerial parts had almost completely withered up. Neighbouring nurseries were also widely affected.

A bacillus was constantly isolated from diseased material, and inoculations with pure cultures produced positive results in healthy asters. Growth became appreciably retarded, and after ten days the leaves at the base began to wither. Brown areas formed on the stems and spread upwards, passing into the petioles and veins and mesophyll of the leaves, which dried up. Fifteen to twenty days after the inoculations the plants were withered completely. The roots remained unaffected, but the stem vessels showed necrosed areas. The organism was re-isolated from the artificially infected plants.

The characters of the organism are as follows: it coagulates milk, decomposes glucose, saccharose, lactose, mannose, mannite, and glycerine without the production of acids or gas, utilizes proteic but not amidic nitrogen, less readily ammonium sulphate, and does not reduce nitrates or form indol, is Gram-negative, non-acid fast, is motile with peritrichiate flagella, rod-shaped, rounded at the ends, measures 2 to 4 by 0·8 to 1·2 μ, occurs singly, in pairs, or frequently (in young cultures) in chains, and forms central, elliptical spores measuring 1 to 2 by 0·6 to 0·8 μ.

Though the organism has some affinities with the *Bacillus vulgatus* group [cf. *R.A.M.*, xii, p. 109], its cultural characters on the whole differentiate it as a new species, and it is named *B. asteris* n.sp.

Williams (P. H.). **Leafy gall of the Chrysanthemum.**—*Rep. exp. Res. Sta. Cheshunt, 1934*, pp. 39–40, 1935.

Further soil inoculations with the organism resembling *Bacterium tumefaciens* isolated from chrysanthemum leafy gall at Cheshunt

[*R.A.M.*, xiii, p. 638] failed to demonstrate its pathogenicity; when it was inoculated into chrysanthemum and tomato stems near the growing-point small swellings were frequently produced, not definitely distinguishable, however, from those due to wounding. The organism is probably saprophytic. Moreover, the results of pot culture experiments with sterilized soil showed that the soil is not a source of infection.

PRETI (G.). **Marciume delle piantine di 'Cephalocereus senilis'.** [Rot of *Cephalocereus senilis* seedlings.]—*Riv. Pat. veg.*, xxv, 1–2, pp. 1–14, 6 figs., 1935.

In July 1934 *Cephalocereus* [*Cereus*] *senilis* seedlings in a nursery in Italy developed a collar rot associated with reduced root growth and a rotting of the tap root and rootlets; ultimately the plants turned yellow and withered.

Under damp conditions the diseased parts of the stems became covered with a white, flocculent, septate mycelium bearing hyaline conidia, which were fusiform, straight, or lanceolate, mostly 3-septate, measuring 29 to 52 by 4·5 to 6·5 μ, but sometimes 1- to 2-septate and 11·6 to 23·2 μ long. The fungus is considered closely to resemble *Fusarium dianthi* [*R.A.M.*, xiii, p. 151]. The maximum, minimum, and optimum temperatures for conidial germination (for which light was necessary) were, respectively, 25° to 30°, 8° to 10°, and 23° C. Infection had been favoured by soil, cultural, and climatic factors, and suggestions are made for control by sanitary practices and soil treatments.

WHITE (H. L.). **Carnation diseases.**—*Rep. exp. Sta. Cheshunt, 1934*, pp. 46–51, 1935.

In 1934 carnations growing in nurseries near Cheshunt developed a serious wilt which was ascertained to be due to *Verticillium cinerescens* [*R.A.M.*, xiii, p. 515]. The results of comparative inoculations showed that *V. cinerescens* caused a slow wilt with extensive vascular infection, whereas *Fusarium culmorum* [loc. cit.] caused a rapid wilt associated with rotting of all the tissues near the point of inoculation. *V. cinerescens* is transferable from crop to crop on cuttings, and is probably spread from one nursery to another on stock exchanged or sold. Tomatoes may safely be used as an alternative crop on carnation beds badly infected with *V. cinerescens*.

ORCHARD (O. B.). **A disease of Winter Cherry.**—*Rep. exp. Res. Sta. Cheshunt, 1934*, pp. 54–55, 1935.

Growers in the vicinity of Cheshunt have lately sustained heavy losses (in one recent case amounting to 30 per cent.) from a *Phytophthora* wilt of winter cherries (*Solanum capsicastrum*), probably due to *P. parasitica*, which attacks the plants at any stage of growth. The first symptom is a slight wilting of the whole or part of the plant; this is followed by total collapse in two or three weeks. The fungus was readily isolated and inoculations in early autumn of stems of healthy plants at soil level caused complete wilting in about three weeks, whilst others on the green stem wood resulted in wilting of the shoot above the point of inoculation in ten days. Tomato seedlings collapsed three days after inoculation. Control measures recommended comprise soil sterilization

or disinfection with Cheshunt compound [*R.A.M.*, xiii, p. 714], and the use of uncontaminated water, e.g., from deep wells or from a water-supply company [ibid., i, p. 373].

MEHLISCH (K.). **Falscher Mehltau an Gloxinien.** [Downy mildew of the *Gloxinia*.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 19, p. 228, 1 fig., 1935.

A species of *Phytophthora* to which the name of *P. speciosa* is given [without a diagnosis] is stated to be responsible for a downy mildew of *Gloxinia* in Germany [cf. *R.A.M.*, vi, p. 462; xii, p. 97]. The leaves and petioles of affected plants are soft and brown and total collapse soon takes place. Oospores of the fungus are formed in tissues placed in a moist chamber. Control should be based on appropriate cultural methods, with special attention to occasional heating of the houses during cool, sunless weather in June and July, supplemented if necessary by the application of a copper-containing spray, such as vomasol C [ibid., xii, p. 380].

BEWLEY (W. F.) & OYLER (E.). **A disease of cultivated Heaths.**—*Rep. exp. Res. Sta. Cheshunt, 1934*, pp. 55–60, 1935.

In June 1934 a serious disease of *Erica hiemalis* and *E. nivalis* appeared in a nursery near Cheshunt. The foliage turned grey, the tops of the plants wilted, and complete withering and death ensued. A species of *Phytophthora* resembling *P. syringae* [*R.A.M.*, xiii, p. 809] was isolated from affected material and inoculations of healthy branches or the soil in which the plants grew gave positive results, the organism being re-isolated from the infected plants. The disease made more progress at cucumber-house temperatures than lower ones.

SOMMER (H.). **Mehltau jetzt auch an Kalanchoe.** [Mildew now also on *Kalanchoë*.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 20, p. 240, 1935.

The species of *Kalanchoë* affected by mildew (*Oidium*) at Darmstadt [*R.A.M.*, xiv, p. 586] is stated to be *K. blossfeldiana*, the only pathogenic fungus hitherto recorded on which appears to be the agent of a stem rot, probably *Fusarium herbarum*. Good control of the mildew has been effected in local nurseries by washing the diseased leaves with a quinosol solution [ibid., xiii, p. 792], though blemishes remain in the form of dark scars. The Geisenheim Phytopathological Experiment Station recommends treatment of the foliage with a solution of soft soap.

SMALL (T.). **Narcissus fire (Botrytis polyblastis, Dowson).**—*Gdnrs' Chron.*, xcvii, 2524, pp. 304–305, 1 fig. (p. 301), 1935.

In March 1933 Victoria daffodils [*Narcissus pseudo-narcissus*] in Jersey were severely attacked by *Botrytis polyblastis* [*R.A.M.*, xiii, p. 772], the identification of which was confirmed by S. F. Ashby. Minute, water-soaked to light brown spots developed on the perianth and corona just as the flowers were ready for picking; overlooked at first, they rapidly spread and destroyed the blooms in a night. Previous reports from the United Kingdom mention the symptoms as affecting

only the leaves, though sclerotia have sometimes been found also near the neck of the bulb. In the present case, however, neither leaves nor bulbs were involved. The attack recurred in March 1935.

BEWLEY (W. F.), ORCHARD (O. B.), & WILLIAMS (P. H.). **Rose diseases.**—*Rep. exp. Res. Sta. Cheshunt, 1934*, pp. 51–54, 1935.

Excellent control of rose mildew [*Sphaerotheca pannosa*: *R.A.M.*, xiii, p. 637] both in glasshouses and the open was obtained at Cheshunt by spraying with copper compounds in an emulsified oil.

The rust used in the 1933 spray tests [loc. cit.] was ascertained to be that which attacks *Rosa canina* and the seedling briars; it is now termed *Phragmidium* A pending complete identification, while that attacking *R. laxa* and cultivated roses is referred to as *Phragmidium* B. The latter is less susceptible to the copper-oil spray than the former and the spray requires to be modified before it can be recommended for use against this disease. Rust collections from different sources were tested on various species and varieties of roses to determine their host range; the results so far obtained are tabulated. To secure infection following inoculation in the laboratory, humidities of not under 90 per cent. were maintained for three to four days. Infection was obtained at temperatures between 60° and 70° F.

The death of rose-trees in gardens and glasshouses was in a large proportion of cases associated with *Coniothyrium rosarum* [ibid., xiv, p. 313].

GRABER (L. F.) & JONES (F. R.). **Varietal survival of Alfalfa on wilt-infested soils.**—*J. Amer. Soc. Agron.*, xxvii, 5, pp. 364–366, 1935.

To determine the influence of bacterial wilt (*Phytomonas insidiosa*) [*Aplanobacter insidiosum*] in curtailing the life of lucerne stands in southern Wisconsin [*R.A.M.*, xiv, p. 515], a field comparison was made between the winter-hardy and wilt-resistant Ladak and Turkestan varieties, the winter-hardy but wilt-susceptible Grimm, Canadian variegated, and Cossack, and the regional strains of susceptible and semi-hardy Montana and South Dakota common lucerne. All the strains were grown on wilt-infested soil. The field was cut twice annually for five consecutive years and the survival ascertained by population counts. Wilt appeared in the summer and autumn of the third year (1932) and all the susceptible varieties, except Cossack, were almost completely eliminated by the disease and winter injury at the end of the third and fourth cutting years. Cossack, though severely infected, proved intermediate in survival incidence between the rest of the susceptible varieties and the resistant types, but only the latter maintained good stands at the close of the fifth year. Wilt infection appeared to reduce the winter survival of the normally hardy but susceptible varieties to such an extent that they behaved temporarily like the non-hardy types.

WEIMER (J. L.). **Leaf spots of Melilotus indica.**—*Plant Dis. Reptr.*, xix, 7, p. 105, 1935.

Sclerotinia sclerotiorum was isolated in January, 1935, from large, light brown spots on the leaves and from decaying stems of *Melilotus*

alba at Riverside, California. Inoculation experiments with ascospores of the fungus gave positive results on *M. indica*, apparently not hitherto recorded as a host of *S. sclerotiorum* [*R.A.M.*, iii, p. 651]. *M. indica* was further observed in February to be heavily infected by a species of *Cercospora* with spores measuring 27 to 38 by 2 to 3·6 μ and thus falling within the range fixed by Horsfall for *C. zebrina* [ibid., ix, p. 319].

CSORBA (Z.). **Untersuchungen über die Ursachen der Empfänglichkeit und Widerstandsfähigkeit der Apfelsorten gegen den Apfelmehltau.** [Studies on the causes of susceptibility and resistance of Apple varieties to Apple mildew.]—*Z. PflKrankh.*, xlv, 5, pp. 280–296, 12 figs., 1 graph, 1935.

This is an expanded account of the writer's investigations at the Budapest Phytopathological Institute on the causes underlying the susceptibility and resistance of some standard apple varieties to mildew (*Podosphaera leucotricha*), a note on which has already appeared [*R.A.M.*, xii, p. 517]. The resistant varieties used included Török Bálnit, Entz's Rosmarin, and Red Winter pogácsa, while among the susceptible sorts were Jonathan, Muscatel Pippin, and Yellow Bellflower.

CHRISTOFF (A.). **Mosaikfleckigkeit, Chlorose und Stippenfleckigkeit bei Äpfeln, Birnen und Quitten.** [Mosaic spotting, chlorosis, and bitter-pit spotting in Apples, Pears, and Quinces.]—*Phytopath. Z.*, viii, 3, pp. 285–296, 12 figs., 1935.

Further observations are made on the virus chlorosis of apples and other Rosaceae in Bulgaria [*R.A.M.*, xiv, p. 316]. The following varieties of three-year-old grafted apple-trees in the State nursery at Tscherwena woda were affected by mosaic or infectious chlorosis. Stanimaschka Aivania, Kitschowka, Winter Golden Pearmain, Baumann's Pippin, Yellow Bellflower, Momitzi, Large Kassel Pippin, Kokradjanka, and Champagne Pippin. In the thirty-year-old orchards of Obrastzow-tschiflik the fruit of all the affected varieties was shed in quantities up to maturity. In the Grey French Pippin a deformation of the corolla of the blossoms on individual branches was noted, similar to that occurring in *Rosa gallica* attacked by mosaic. Slight deformation of the fruits was observed in Large Kassel Pippin and Winter Citron, the latter also showing occasional marked symptoms of bitter pit [ibid., xiv, p. 592]. The latter disease was also prevalent on Schöne Josephina fruits, and buds of this variety grafted on a wild damson and four wild apples resulted in the development of mosaic symptoms on these hosts after 9 and 27 days, respectively. Similar results were later obtained on a Winter Golden Pearmain inoculated with the juice of an affected Schöne Josephina apple, the incubation period in this case being ten days. These data are considered to show that bitter pit partakes of the nature of mosaic and virus chlorosis.

Among the pear varieties liable to mosaic of the foregoing type are Enisseika, Pastor, Edra Kasna, Hardenpont, and other Butter types, Bonne Louise d'Avranches, and Williams' Bon Chrétien. The mottling of the leaves is not of a very accentuated character, and on bearing trees a more or less pronounced chlorosis is often the only outward sign of

disease. The widespread scorching of the foliage frequently observed in southern Bulgaria is thought to be largely due to the virus. A very typical feature of the disease is the formation of superficial, ill-defined, pale, later dark to blackish-brown spots on the pedicels followed by a shedding of the young fruits. Those remaining on the tree develop dark green, scattered or confluent spots, mostly on one side and being either superficial or involving the formation of scars. The inoculation of wild pear and apple seedlings with buds from pear trees affected by chlorosis, scorching, and bitter pit resulted in the development of mosaic after an incubation period of ten days on the pear and of thirty on the apple. Furthermore, buds from Bon Chrétien grafts showing mosaic symptoms were inoculated into three two-year-old wild apples and one pear, with the result that two of the former and the latter developed mottling, the symptoms on the pear resembling those induced by the transmission of mosaic from *R. gallica*. The virus nature of pear chlorosis is considered to account for the conflicting results reported from treatment of the disease with iron salts [ibid., x, p. 676].

On one-year-old quince grafts the symptoms of virus chlorosis are identical with those described for apple and pear, but on bearing trees they are even more variable. Deformation of the fruit is a marked feature on the Portuguese and Bereckzi varieties; in many cases the leaves show contortions and malformations of different kinds, accompanied by chlorosis and scorching. A further anomaly was observed in Portuguese quinces, consisting in a multiplication of the petals from five to as many as ten in a single flower. The fruits of the Portuguese and Bereczki varieties were deeply furrowed and sometimes deformed or grown together; bitter pit developed on the fruits of some varieties (including Portuguese) at maturity and in others during storage, while a network of rust-coloured lesions covered the entire surface of the Bereczki fruits. The damage to quince fruits was the most conspicuous and uniform feature of the virus disease, mosaic and chlorosis of the leaves being relatively slight and sometimes altogether absent. Apple-seedlings inoculated with buds from diseased quinces developed mosaic.

The author concludes from these results that a single virus is responsible for the various disorders herein described on all three fruits.

Nose (T.). **On the ring disease of Pears and the causal organism, especially on its perfect generation of Physalospora piricola n.sp.**—*Ann. agric. Exp. Sta. Chosen*, vii, pp. 156–163, 2 pl., 1933. (Japanese.) [Abs. in *Jap. J. Bot.*, vii, 3–4, p. (54), 1935.]

The destructive ring disease of pears so prevalent in Korea has been found to be due to *Macrophoma kuwatsukaii* Hara, the perfect stage of which is a new species of *Physalospora*, for which the name *P. piricola* [*R.A.M.*, xiv, p. 498] is proposed. The fungus, which produces a number of blackish-grey, concentric lesions in the fruits, has been shown by inoculation tests to be pathogenic to apples.

Montemartini (L.). **Note di fitopatologia.** [Phytopathological notes.]—*Riv. Pat. veg.*, xxv, 1–2, pp. 25–31, 1935.

After discussing the severe outbreaks of vine mildew [*Plasmopara viticola*] that, favoured by the prevailing weather conditions, occurred

in certain localities in Italy in 1934 [*R.A.M.*, xiv, p. 75] the author briefly describes a disease of pear trees associated with a *Verticillium* morphologically similar to *V. albo-atrum* [ibid., x, p. 757; xiv, p. 265]. The fungus was confined to the wood of the trunk but caused a reddening of the foliage either by means of a toxic secretion or by the obstruction of the transpiration current.

Black spot of Plums.—*Fruit World, Melbourne*, xxxvi, 5, p. 268, 1935.

Black spot of plums (*Bacterium pruni*) [*R.A.M.*, xiii, p. 424] is stated to be increasing in the Stanhope district of Queensland, where no variety appears to be immune, but October Purple is the most susceptible. The first sign of the disease is the 'shot hole' appearance of the leaves, which drop off. Black spots surrounded by a dark green ring appear on the unripe fruit, which later cracks, and dark patches are produced on the buds, which crack as the wood ages, forming deep wounds in which the organism overwinters. Infected trees should be severely pruned, and as much as possible of the diseased wood removed and burnt. An application of zinc sulphate and lime [ibid., xiii, p. 564] at a strength of 6–4–40 should be given at bud-burst, followed by several further ones of 4–4–40 during summer.

Wormald (H.). **Preliminary laboratory tests of bactericides on the Plum bacterial canker organism.**—*Rep. E. Malling Res. Sta. 1934*, pp. 151–155, 1935.

Preliminary tests [which are described] made to ascertain the bacteriostatic (growth-inhibiting) and bactericidal (lethal) effect of various germicides on *Pseudomonas mors-prunorum* showed that growth was completely inhibited (in nutrient broth plus 1 per cent. saccharose) by 0·1 per cent. phenol, 0·01 per cent. formaldehyde (1 in 4,000 commercial formalin), 0·005 per cent. chino-[quino-]sol [see above, p. 637], 0·2 per cent. copper sulphate, 0·01 per cent. copper chloride, 0·005 per cent. zinc sulphate, or 0·0005 per cent. mercuric chloride. Immersion in aqueous solutions of 0·01 per cent. copper sulphate or 1 per cent. tar-oil killed the organism in 10 minutes, while zinc sulphate at 0·2 per cent. strength required an exposure of 20 hours.

Wormald (H.) & Painter (A. C.). **Brown rot of Plums in cold storage.**—*Rep. E. Malling Res. Sta. 1934*, pp. 148–150, 1935.

Plums stored at about 40° F. at East Malling Research Station, Kent, rotted after three to four weeks, becoming covered with a white, fluffy mycelium. The fungi chiefly responsible for the rot were *Sclerotinia fructigena* (which predominated), *S. laxa* [*R.A.M.*, xiv, p. 593], *Botrytis cinerea*, a species of *Penicillium*, and one of *Mucor*. When the plums were removed to the light *S. fructigena* tended to develop its normal, yellowish, cushion-like *Monilia* fructifications. The infected plums often adhered in clusters, showing that the disease may spread in storage from one primarily infected fruit to others in contact with it. For purposes of control improved orchard sanitation and the avoidance of injury during picking and storing are recommended.

CHANDLER (W. H.) & HOAGLAND (D. R.). **Comments on the article by A. Kozlowski on 'Little leaf or rosette of fruit trees in California'.** —*Phytopathology*, xxv, 5, p. 522, 1935.

The writers disclaim any participation in Kozlowski's views [stated to be based on the misinterpretation of certain limited observations] as to the nature of little leaf or rosette of fruit trees in California [*R.A.M.*, xiv, p. 449], and point out that he omits all reference to the specific action of zinc [ibid., xiii, p. 39] in relation to this disease.

HARRIS (R. V.). **Some observations on the Raspberry disease situation in North America.**—*Rep. E. Malling Res. Sta. 1934*, pp. 156–164, 1935.

In this paper, based largely on observations and experiments made during a year's residence at the Dominion Laboratory of Plant Pathology, St. Catherines, Ontario, the author gives notes on the raspberry disease situation in Canada and the United States, with special reference to virus diseases, and compares it with the situation in Great Britain. A brief account is also given of the Dominion Government raspberry certification scheme against mosaic and of breeding work in progress, chiefly against mosaic disease, in Canada and the United States [cf. *R.A.M.*, xiii, p. 357].

COLBY (A. S.), ANDERSON (H. W.), & FLINT (W. P.). **Bramble fruits. Raspberries : Blackberries : Dewberries. How to grow in Illinois.**—*Circ. Ill. agric. Exp. Sta.* 427, 72 pp., 1 col. pl., 32 figs., 1935.

In Part II of this comprehensive treatise on the commercial cultivation of raspberries, blackberries, and dewberries in Illinois, H. W. Anderson gives semi-popular notes on a number of well-known fungous, bacterial, and virus diseases [*R.A.M.*, xii, p. 770; xiii, p. 685; and preceding abstract] and their control. The symptoms of leaf curl, mosaic, and streak on raspberries are shown on a coloured plate.

FLINT (W. P.) & ANDERSON (H. W.). **Directions for spraying fruits in Illinois.**—*Circ. Ill. agric. Exp. Sta.* 429, 24 pp., 3 figs., 1 map, 1935.

In this circular (a revision of No. 388 of the same series) directions are given for the control of the insect pests and fungous diseases affecting the fruit crops of Illinois by means of systematic applications of standard disinfectants.

ATANASOFF (D.). **Mosaic of stone fruits.**—*Phytopath. Z.*, viii, 3, pp. 259–284, 26 figs., 1935.

The writer's account of his studies on the mosaic or pox disease affecting stone fruits in Bulgaria and elsewhere has already been noticed from another source [*R.A.M.*, xiv, p. 367].

PADY (S. M.). **Aeciospore infection in Gymnoconia interstitialis by penetration of the cuticle.**—*Phytopathology*, xxv, 5, pp. 453–474, 2 pl., 4 figs., 1 diag., 1935.

The results [which are fully described] of a series of inoculations at the New York Botanical Garden on blackberry, *Rubus occidentalis*,

and *R. canadensis* leaves with aecidiospores of the long-cycle rust, *Gymnoconia interstitialis* [*R.A.M.*, xii, p. 706], showed that infection takes place by means of appressoria formed at the ends of the germ-tubes. A well-defined penetration peg traverses the cuticle and cell wall and a short penetration hypha is formed in the epidermal cell. The hypha pierces the lower wall of the host cell and enters the intercellular space just below. The mycelium spreads rapidly in the leaf tissue, haustorial development being apparent after five days. Teleutospores were formed from 21 days onwards. Penetration was equally well effected through the upper (stoma-free) or the lower leaf surface of the test plants, and further evidence is adduced showing the unimportance of the stomata from the standpoint of infection. Leaves already infected by the haploid stage were similarly penetrated, no antagonism existing between the two mycelia.

Panama disease of Bananas—one-root system.—*J. Jamaica agric. Soc.*, xxxix, 4, pp. 239–241, 1935.

In a discussion at a meeting of the Board of Management of the Jamaica Agricultural Society held on 3rd April 1935 it was stated that the Advisory Committee on the banana and citrus industries had decided to recommend a change in the treatment of Panama disease [*Fusarium oxysporum cubense*: *R.A.M.*, xiv, p. 378] by requiring the removal of only the diseased plant ('one-root treatment') as a general regulation. The Director of Agriculture had come to the conclusion that this change would have to be made to secure the full co-operation of the growers, the loss of plants on the old system ('nine-root treatment') being now so severe that the regulations were no longer being effectively carried out.

Serrano (F. B.). **Control of Pineapple mealy-bug wilt.**—*Philipp. J. Sci.*, lvi, 2, pp. 111–125, 2 pl., 1935.

Exhaustive field tests [a tabulated account of which is given] carried out in 1930 in the pineapple plantations of the Philippine Packing Corporation, showed that the control of mealy-bug wilt was effected by the measures devised for the extermination of the insect (*Pseudococcus brevipes*) associated with this destructive disease, which affects mainly the premier commercial Smooth Cayenne variety [*R.A.M.*, xiv, p. 457].

Wilson (E. E.). **The Olive knot disease: its inception, development, and control.**—*Hilgardia*, ix, 4, pp. 233–264, 3 figs., 3 diags., 3 graphs., 1935.

The olive knot disease (*Bacterium* [*Pseudomonas*] *savastanoi*) [*R.A.M.*, xii, p. 521; xiii, p. 551] is stated to have become within the last five years highly destructive in California. As a result of investigations started in 1931, it was experimentally confirmed that rain is mainly responsible for the spread of the disease by washing downwards the bacteria which are exuded on the surface of the knots, and there was evidence indicating that wind-driven rain may also be responsible for

the distribution of the organisms in a lateral direction. Insects do not appear to be commonly involved in the spread of the disease. Field observations suggested that infection occurs during almost any rainy period, but chiefly during the longer rainy spells in mid-winter. As indicated by greenhouse tests, temperatures within the range observed during most winter and spring seasons do not appear to be a limiting factor. Apart from wounds on the branches, infection takes place through scars produced by the dropping of leaves, individual blossoms, and racemes, but mostly at the leaf scars, apparently during winter, when continued leaf fall provides fresh, infectible tissue, or at an earlier period, when cork formation is slow.

While under field conditions knot lesions do not develop during the winter and only appear in the spring, macroscopic symptoms developed in two weeks on trees transferred to temperature conditions favourable to growth. Observations and experiments also showed that the formation of secondary knots at a distance from primary infections through metastasis is not of common occurrence.

None of the commercial olive varieties grown in California has proved to be immune from the disease. The Mission variety, which formerly had been least affected, was badly attacked following a heavy frost in December 1932, resulting in the splitting of the bark and defoliation during the rainy season. The Sevillano, Nevadillo Blanco, and Manzanillo varieties are highly susceptible.

Spraying experiments showed that autumn, winter, and spring applications of home-made Bordeaux mixture are effective in preventing infection. The application should be renewed at different times during the winter and spring, the first spraying being made in the autumn before the onset of the rainy period.

Read (W.). **Insecticide and fungicide investigations. 1. General.**—*Rep. exp. Res. Sta. Cheshunt, 1934*, pp. 79–80, 1935.

In tests with oil-soluble copper compounds at Cheshunt the best results were obtained by emulsifying equal volumes of a 20 per cent. glue solution and a 50 per cent. solution of copper oleate in cottonseed oil. The copper oleate solution was a fairly stiff grease at normal temperatures, and the emulsification process was conducted at approximately 60° C. The product was a stable emulsion, sufficiently fluid to mix easily; it creamed very slowly when diluted to 1 in 120 with hard water. At this concentration it spread well on rose foliage and gave effective control of *Sphaerotheca pannosa* [see above p. 638.]

Isaakides (C. A.). **Greece: losses caused by diseases, pests, and meteorological conditions.**—*Int. Bull. Pl. Prot.*, ix, 5, p. 107, 1935.

Inquiries by the Phytopathological Institute, Benaki, at Kiphissia, in collaboration with the Greek agricultural services, showed that in 1932 the estimated loss of agricultural products, valued at a total of 12,751,059,000 drachmas [nearly £24,000,000], from diseases was 548,058,000 drachmas [over £1,000,000]. In 1933 the corresponding figures were 14,576,148,000 [over £28,000,000], and 503,637,000 [nearly £1,000,000], respectively.

VIENNOT-BOURGIN (G.). **Contribution à l'étude des cryptogames de Seine-et-Oise. (9e note). Notes sur les Urédinales et Ustilaginales observées en 1933–34 dans le département de Seine-et-Oise (région sud).** [Contribution to the study of cryptogams in Seine-et-Oise. (9th note.) Notes on the Uredinales and Ustilaginales observed in 1933–4 in the department of Seine-et-Oise (south region).]—*Bull. Soc. Sci. Seine-et-Oise*, Ser. III, iii, 1–3, pp. 1–17, 1935.

This is an annotated list of 91 rusts and 19 smuts which were observed in 1933–4 in the southern part of the department of Seine-et-Oise, in addition to those given in 1933 [*R.A.M.*, xii, p. 537]. It is stated, *inter alia*, that numerous inoculations on wheat and *Agropyron repens* showed that aecidiospores formed on *Thalictrum minus* and *T. glaucum* may give either *Puccinia triticina* or *P. persistens*, it being impossible to predict which of these forms will result. Snapdragon rust (*P. antirrhini*) [ibid., xiv, p. 446] caused considerable damage in 1933 and in the autumn of 1934; owing to the mild winter, uredospores continued to be formed as late as January, 1935, both on old stocks and on volunteer plants.

BEAUMONT (A. B.) & SNELL (M. E.). **The effect of magnesium deficiency on crop plants.**—*J. agric. Res.*, l, 6, pp. 553–562, 4 figs., 1935.

The results of field plot experiments from 1929 to 1934, inclusive, in Massachusetts on magnesium-deficient soil showed that of the 17 species of crop plants that were tested buckwheat and spinach were most affected by the deficiency, and turnips, mangels, maize, and tobacco considerably so; all the others, including potatoes and clovers, were only slightly affected. A characteristic symptom was the development of chlorosis of the older leaves in the intervascular tissue; in severe cases the margin or entire leaf turned brown. There was evidence that to avoid magnesium deficiency troubles the soil should contain 60 to 80 lb. of easily replaceable magnesium per acre.

VANDENDRIES (R.) & BRODIE (H. J.). **Nouvelles investigations dans le domaine de la sexualité des Basidiomycètes et étude experimentale des barrages sexuels.** [New investigations in the domain of sexuality in the Basidiomycetes and an experimental study of sexual barriers.]—*Cellule*, xlii, 2, pp. 163–209, 1 pl., 27 figs., 7 diags., 1933. [Received August, 1935.]

In this paper the authors give a full account of their investigation into the sexual polarity of the basidiospores of several Basidiomycetes [cf. *R.A.M.*, xiii, p. 532]. Marked repulsion having been observed between non-fertile combinations of the tetrapolar species *Lenzites betulina*, a more detailed study of this phenomenon was undertaken, the results of which may very briefly be summarized as follows.

The repulsion was stronger between aerial hyphae than between those embedded in the culture medium, and was not, apparently, chemical. When the haplonts were completely separated by a vertical glass partition, the influence causing the repulsion passed through the partition, which by itself had no effect on the development of the hyphae; further experiments showed that the action took place through

mica, paraffin, and celluloid, but not through lead. The use of loosely fitting lead partitions of various thicknesses demonstrated that the incomplete nature of the partition had no effect on the phenomenon, whereas the degree of thickness did; with one and the same partition, certain haplont combinations gave rise to a barrier and others not; the intensity of the repulsion depended on the density of the opposing growths.

The experiments, taken as a whole, showed that the nature of the agent responsible for the barrier formation cannot be accounted for on any hypothesis of chemotaxis; no magnetic or electrical action can be involved, and the only comparable biological phenomenon is Gurwitsch's mitogenetic radiation. If the phenomenon is due to radiation it presupposes the presence of two emissive and receptive factors obeying Mendelian laws carried by the chromosomes of the nuclei. Proof was obtained that the nucleus of a dicaryon retains the ability to emit radiations and cause the diploid mycelium containing it to behave as a haplont in the formation of the barrier.

Corneli (E.). **Azione a distanza dei metalli sopra alcune specie fungine.** [Action at a distance of metals on some species of fungi.]—*Riv. Pat. veg.*, xxiv, 9–10, pp. 397–406, 1 pl. [on p. 412], 1934. [Received July, 1935.]

When spore suspensions of *Penicillium glaucum* in hanging drop cultures were exposed to a lead disk [cf. *R.A.M.*, xiii, p. 178] in hermetically sealed glass containers only a small percentage of the spores germinated, the figure being highest when the lead was farthest away (3·5 mm.) and lowest when it was nearest (1 mm.). When the spores were removed to normal conditions in the absence of the metal, growth was resumed, and was more rapid than in the controls. The effect of the radiation was less marked on the spore masses than on single spores, and when open containers or copper and silver disks in closed ones were used no appreciable effect of the radiation resulted.

Further experiments indicated that the distance of the metal from the fungus was less important than the area of the disk and the volume of the container, the effect of a disk of given size at a given distance increasing as the volume of the container decreased.

Ascochyta pisi and *Tricothecium roseum* were less susceptible to the radiation than was *P. glaucum*; the uredospores of *Uromyces betae* remained unaffected.

That germination was reduced only in sealed containers was due, in the author's opinion, to the fact that in these there was a constantly increasing accumulation of secondary radiation [loc. cit.], or a progressively more complete ionization of the atmosphere.

Sempio (C.). **Azione di alcuni metalli a distanza, per contatto, ed in soluzione sullo sviluppo della 'Thielavia basicola' Zopf. e su altri parassiti.** [The action of certain metals at a distance, in contact, and in solution on the development of *Thielavia basicola* Zopf. and on that of other fungi.]—*Riv. Pat. veg.*, xxiv, 9–10, pp. 413–491, 1 pl. [on p. 492], 1934. [Received July, 1935.]

In this paper the author gives the results of his elaborate investiga-

tion of the effect of radiation by different metals on the germination and subsequent development of the conidia of *Thielavia* [*Thielaviopsis*] *basicola* and other fungi [see preceding abstract].

At a distance of 1–2 mm. from the fungus in hanging drop broth cultures, lead either prevented germination of *T. basicola* conidia altogether, or retarded growth considerably; the mycelium developed characteristic swellings and rosette formations, and conidia were scarcely ever produced. If the lead was removed before or at the commencement of germination the fungus at once began to grow rapidly, the mycelium being similar to that of the controls, though less developed. Copper and aluminium very slightly retarded the early stages of development of *T. basicola,* while platinum, silver, and gold had practically no effect on germination and only a slightly depressive effect on growth of the germ-tube.

When copper, aluminium, or silver filings were placed in contact with the conidia of *T. basicola* in hanging drop broth cultures growth was completely inhibited as a result of large amounts of the metals passing into colloidal solution; gold and platinum filings had practically no effect, and lead was very slightly depressive.

When tested on the conidia of *T. basicola* grown in hanging drops of 2 per cent. saccharose and glycocoll, the addition of copper nitrate (to make M/1,000 solution), aluminium nitrate, or lead nitrate (both at M/10,000) had practically no effect, gold chloride slightly more, and platinum chloride still more, while silver nitrate (all at M/10,000) completely inhibited growth.

While there was a certain parallel between the effects produced by the metals in contact with the fungus and those produced by the same metals in solution, no parallel existed between these effects and those produced by the same metals at a distance. The author considers that the action at a distance was radically different from that of the metals in contact with the fungus or in solution; it was not a direct effect of the metals as such, but an indirect effect shown as a capacity to emit radiation.

When the metals were placed at a distance of 1 to 2 mm. from the spores of *Erysiphe graminis* and *Puccinia graminis* in water or broth hanging drop cultures practically no effect was produced.

Sempio (C.). **Influenza di alcuni cationi sulla recettività del Ricino al 'B. tumefaciens' e sullo sviluppo di quest' ultimo in coltura (agar di brodo).** [The influence of certain cations on the susceptibility of *Ricinus* to *Bacterium tumefaciens* and on the growth of the latter in culture (broth agar).]—*Riv. Pat. veg.*, xxiv, 9–10, pp. 493–556, 2 figs., 1 graph, 1934. [Received July, 1935.]

Experiments [which are described in detail, and the results of which are tabulated and discussed] on the effect of certain elements (as indicated by the action of their nitrate solutions) on the resistance of *Ricinus* seedlings to *Bacterium tumefaciens* showed that at the concentrations used thorium, uranium, aluminium, cerium, potassium, palladium, lead, barium, zirconium, zinc, strontium, silver, iron, and lithium were not markedly injurious to the seedlings, while nickel, cadmium, copper, mercury, and cobalt were.

Thorium, uranium, and aluminium had practically no effect on tumour development; cerium, potassium, palladium, lead, barium, zirconium, zinc, and strontium stimulated it, while the effects of silver and iron were doubtful. Cadmium, the most toxic of the metals to the seedlings, occasionally strikingly stimulated tumour growth, which showed no strict relationship to plant vigour. At a concentration of M/90,000 the nitrate slightly stimulated the growth of the seedlings and markedly stimulated that of the tumours. Copper frequently stimulated, though it sometimes depressed, tumour development; mercury at concentrations of the nitrate higher than M/15,000 or M/20,000 depressed it, but at M/30,000 to M/50,000 stimulated it; while cobalt nitrate at M/15,000 almost completely inhibited it.

Thorium, uranium, aluminium, cerium, lead, and cobalt had practically no effect on the growth of the bacterium in culture; iron was almost innocuous; potassium, zinc, strontium, and cadmium depressed it; barium and zirconium stimulated it; silver was definitely toxic; copper was highly toxic; and mercury was the most toxic of all, a M/50,000 solution of the nitrate killing the organism in a little over 8 hours.

These results strongly suggest that the effect of the metals on tumour growth was mainly due to the stimulation or depression of the natural resistance of the host to *Bact. tumefaciens*.

Reed (G. M.). **Physiologic specialization of the parasitic fungi.**—*Bot. Rev.*, i, pp. 119–137, 1935.

Following a brief introduction, the writer discusses the problem of physiologic specialization in parasitic fungi under the following headings: physiologic specialization in the cereal rusts; geographical distribution of rust races; physiologic specialization in the smuts; physiologic specialization in the powdery mildews and other fungi; morphological variations in specialized races; influence of environal factors on the reaction of differential hosts to various physiologic forms of rusts; the constancy of specialized races; and the origin of new specialized races. With the exception of a few papers published before 1922, all the work mentioned in the bibliography of 95 titles has been noticed in this *Review*.

Winge (Ö.) & Hjort (A.). **On some Saccharomycetes and other fungi still alive in the pure cultures of Emil Chr. Hansen and Alb. Klöcker.**—*C.R. Lab. Carlsberg*, Sér. Physiol., xxi, 2, pp. 51–58, 1935.

It is apparent from this tabulated account of the writers' examination in 1933–4 of pure cultures on 10 per cent. saccharose or beer wort agar of a number of Saccharomycetes and other fungi stored at the Carlsberg Laboratory, Copenhagen, between 1886 and 1922 that a considerable proportion was still viable—some 14 per cent. of the earlier and 25 per cent. of the later series—among which may be mentioned *Aspergillus oryzae* ('86), *Monilia candida* [*Candida vulgaris*: *R.A.M.*, xiv, p. 444], the strain of *Saccharomyces cerevisiae* [ibid., xiv, p. 582] isolated from Namur beer and used by Wildiers in his studies on bios [ibid., iii, p. 293] (1920), *Aspergillus nidulans* [ibid., xiv, p. 523] ('13), *Penicillium*

roqueforti [ibid., xiii, p. 443] ('22), and *Citromyces pfefferianus* [ibid., xiv, p. 115] ('19).

Narasimhan (M. J.). **Spraying against Alternaria of Potato.**—*Mysore agric. Cal. 1935*, pp. 17, 21, 1 pl., 1935.

Successful control of *Alternaria* disease of potatoes [*A. solani*] in Mysore [*R.A.M.*, xiii, p. 683] was obtained in small-scale experiments by applications of calcium arsenate (1 lb. in 50 galls. water) with lime caseinate as spreader, 30 to 40 days after planting, the treated plots yielding nearly 2½ to 3 times as much as the unsprayed controls. If necessary a second spray should be given when the crop is 50 to 60 days old. The cost of spraying a 30-days-old crop amounted to between 4 and 5 rupees [6*s.* and 7*s.* 6*d.*] per acre.

Macleod (D. J.) & Howatt (J. L.). **Magnesium deficiency in Potatoes.**—Abs. in *Sci. Agric.*, xv, 6, pp. 435–436, 1935.

Satisfactory control of a potato disorder apparently similar to the magnesium deficiency reported from the United States [*R.A.M.*, xiii, p. 797] is stated to have been obtained in New Brunswick by the addition to the ordinary fertilizer (4–6–10) of dolomitic lime, kieserite [containing magnesium sulphate], magnesium sulphate, or magnesium carbonate, all of which were found to be equally effective when supplying the equivalent of 20 lb. magnesium oxide per acre.

Verplancke (G.). **Étude d'une forme nouvelle de la 'bigarrure' de la Pomme de terre.** [A study of a new form of Potato streak.]—*Bull. Soc. Bot. Belg.*, Sér. 2, xvii, 2, pp. 105–116, 1935.

Further investigations into the nature of the potato virus disease recently recorded by the author from Belgium as a form of streak or 'streak-mosaic' [*R.A.M.*, xiv, p. 251] showed that artificial transmission by approach- or tuber-grafting gave substantially the same symptoms as transmission by rubbing or insect vectors.

Both the streak and mosaic symptoms produced by the disease were manifested on an Alpha plant inoculated by grafting, one branch of which showed mosaic symptoms and another those of streak. This suggested the presence of two viruses, but inoculations on Arran Victory plants, either with sap or by approach grafting from either the mosaic or streak branches, resulted in the production of the typical streak symptoms. From this the author concludes that the disease is due to only one virus.

Rapid purification of the causal organism by a modification of Kligler's and Olitsky's technique [*Brit. J. exp. Path.*, xii, pp. 172, 393, 1931], using carbon as the adsorbent, gave a suspension of the virus which contained only 0·101 per cent. solids.

The virus responsible for 'bigarrure' is stated to differ from the potato viruses Y [ibid., xiv, p. 326], M29 (which is probably a blend of M23 and R77) [ibid., xii, p. 586; xiii, p. 462], X–2, X–3, and X–4 [ibid., xiii, pp. 319, 797] (since it produces no symptoms on tomato), and from X–1 (in that it is transmissible by rubbing to potato varieties to which X–1 is not so transmissible). The disease, therefore, appears to be different from all previously described forms of streak.

Pfankuch (E.) & Lindau (G.). **Zur Biochemie des Kartoffelabbaues. II (1).** [A contribution to the biochemistry of Potato degeneration. II (1).]—*Biochem. Z.*, cclxxvii, 1–2, pp. 129–138, 2 graphs, 1935.

The writers' studies [the results of which are fully discussed and the statistical data tabulated] on potato degeneration at Dahlem, Berlin, indicate that the disordered metabolism constantly associated with this phenomenon arises primarily from changes and acceleration in the oxido reductions [cf. *R.A.M.*, xiv, p. 328].

Klapp (E.), Morgenweck (G.), & Spenneman (F.). **Ökologie und 'Abbau' der Kartoffel. Beziehungen zwischen Ertragshöhe, Nachbaustufen, Krankheitsbefall, und praktischen Pflanzwert.** [Ecology and Potato 'degeneration'. Relations between productivity, progeny grades, disease incidence, and practical planting value.]—*Pflanzenbau*, xi, 10, pp. 383–395, 1 diag., 5 graphs, 1935.

The results of four years' observations on the performance of original seed and progeny of the Parnassia and Erdgold potato varieties in 21 localities representing the ecological variability of Central Germany showed that, with a few striking exceptions, the yields of the progeny were very poor. In some cases the behaviour of the progeny in respect of productivity was diametrically opposed in two different places. Certain consignments of planting material of unexceptionable origin very soon developed symptoms of leaf roll, mosaic, streak [*R.A.M.*, xiv, p. 54], or stunting in one locality, while in another they and their progeny remained practically free from disease. Apart from extreme cases, the yield in the different sites of cultivation was not appreciably affected by the incidence of disease present in the crops. Streak, in particular, showed a tendency to disappear from one year to the next, and, in general, the symptoms of the various disorders were liable to merge into one another. Cases were noted in which stands with a comparable amount of disease proved to be of totally different planting value, and conversely, seed of a similar degree of productivity originated in crops with a very variable percentage of 'degeneration'. It must be assumed, therefore, either that there is no definite correlation between health and yield or (more probably) that environmental factors are at least equally important with pathological activities, the former predominating at one time and the latter at another.

Němec (A.). **Beitrag zur Kenntnis der chemischen Beschaffenheit von krebsverseuchten Kartoffelböden.** [A contribution to the knowledge of the chemical constitution of wart-infested Potato soils.]—*Phytopath. Z.*, viii, 3, pp. 303–305, 1935.

Chemical analyses [the data from which are tabulated and briefly discussed] of some potato soils infested by wart disease (*Synchytrium endobioticum*) in northern Czecho-Slovakia [*R.A.M.*, xiii, p. 723] indicated a general abundance of humus and an excess of phosphoric acid combined with a more or less markedly acid reaction. There was found to be a low content of exchangeable lime and magnesia. Similar conditions prevailed in the southern localities investigated except for a deficiency of phosphoric acid. These results do not permit any con-

clusion to be drawn concerning the effect of soil constitution on the distribution of the disease, but it is thought that the excessive use of stable manure in these districts may possibly be a contributory factor in its spread [cf. ibid., vii, p. 738].

JANY. **Welche Kartoffelsorten werden in Deutschland am meisten gebaut?** [Which Potato varieties are most widely grown in Germany?]—*Dtsch. landw. Pr.*, lxii, 18, p. 217, 1935.

Schlumberger estimates that in 1933 potato varieties immune from wart disease [*Synchytrium endobioticum*] constituted 22,000 (57·8 per cent.) of the total area of 38,000 hect. certified as satisfying official seed certification requirements [cf. *R.A.M.*, xi, p. 65; xiii, p. 466, *et passim*]. Apart from the early varieties (20 per cent. of the whole) the immunes occupied 47·8 per cent. and the susceptibles 32·2 per cent. or roughly a ratio of 3:2, and in the writer's opinion the time is not far distant when the former will be exclusively cultivated in Germany.

DOUNINE (M. S.) & YAKIMOVITCH (E. D.). Болезни Батата и меры борьбы с ними. [Sweet Potato diseases and their control.]—247 pp., 102 figs., Всесоюзн. Науч.-Исслед. Инст. Сои и Спецкультур [Pan-Soviet sci. Res. Inst. Cult. Soy-Bean and Spice Crops], Moscow, 1934. [Received July, 1935.]

The attempts which are now being made to spread sweet potato cultivation in the southern and eastern Republics of the Soviet Union have prompted the authors to publish this useful monograph, compiled mainly from foreign sources, summarizing all the information up to date on the more important diseases of the crop. The diseases are subdivided into those that appear during storage of seed material and in the greenhouse, those that only occur in the field, and commercial storage rots of the roots, the morphology, taxonomy, biology, geographical distribution, and control of the causal organisms being fully dealt with.

Observations in 1932 in Poti [Black Sea littoral of the Caucasus] showed the occurrence there of the following parasitic fungi, apparently new to science, which are described with diagnoses in Russian by Khokhryakoff and Dyurinski. *Leptosphaeria bataticola* n.sp., causing brown spots on the leaves, has perithecia up to 130 μ in diameter, with an emergent ostiole; the asci are cylindrical, pedicellate, rounded at the apex, 53 to 65 by 10 to 11 μ, intermixed with paraphyses; the spores are light yellow, cylindrical-fusiform, with pointed ends, 5-septate, and measure 25 to 28 by 4·5 μ. *Leptosphaerulina bataticola* n.sp., forms on the leaves rounded or oblong, brown spots, 1 to 2 cm. in diameter; the perithecia are light coloured, parenchymatous, up to 150 μ in diameter; the asci are broadly ellipsoidal, ovate or piriform, and 55 to 63 by 31 to 35 μ; and the ascospores are light brown, elliptical, slightly constricted at the septa, with three (more rarely four) transverse and one longitudinal septa, and measure 23 to 34 by 12 to 14 μ. *Coniothyrium bataticola* n.sp. forms on the leaves irregular, coalescing, whitish spots, which frequently drop out, involving a large portion of the blade. The pycnidia are fairly numerous, non-ostiolate, and up to 155 μ in diameter. The spores are brown, ellipsoidal, and 9 to 12 by 4·5 to 6 μ.

Ascochyta bataticola n.sp. forms on the leaves amphigenous, whitish or ochraceous, irregular, rounded or oblong spots, measuring 2 to 8 mm. in diameter. The pycnidia are chiefly epiphyllous, parenchymatous, and 210 μ in diameter. The spores are cylindrical or slightly fusiform, uni-(more rarely bi-) septate, and 10 to 16 by 2 to 4·5 μ. *Robillardia bataticola* n.sp. forms on the leaves dark-brown, irregular or rounded spots, up to 1 cm. in diameter, and concentrically zonate with a light-coloured centre; the infected tissues drop out, thus destroying a large part of the lamina. The pycnidia are fairly numerous, epiphyllous, paraplectenchymatous, up to 155 μ in diameter, with a slightly prominent ostiole. The spores are cylindrical or fusiform-ellipsoidal, slightly pointed at the ends, almost hyaline or faintly olive-brown (brown in mass), straight, slightly bent, or inequilateral, 11 to 15 by 3 to 4 μ, with two or three cilia at one end, about 15 μ in length. *Stagonospora bataticola* n.sp. forms on the leaves brown, irregular or rounded, sharply delimited spots, up to 1 cm. in width. The pycnidia are 125 μ in diameter, with a dark, prominent ostiole 6 to 10 μ wide. The spores are triseptate, almost hyaline or slightly fuliginous, somewhat bent or sinuous, and 25 to 30 by 3 to 3·5 μ. *Ramularia bataticola* n.sp. forms on the leaves whitish or yellowish-brown (brown on the under surface) spots, up to 4 mm. in diameter. The fasciculate, hyaline conidiophores emerge through the stomata on the upper surface. The conidia are hyaline, cylindrical, with tapering, rounded ends, bicellular, and 12 to 15 by 3 to 4 μ. *Brachysporium batatatis* n.sp. forms hypophyllous, brownish, sharply delimited, irregular or rounded spots. The conidiophores are nodose, septate, brownish, and 77 to 100 by 5 to 6 μ. The conidia are fusiform, smoky-brown, triseptate, and measure 27 to 34 by 10 to 15 μ; the two end cells are hyaline, and the central ones swollen. *Helminthosporium bataticola* n.sp. forms amphigenous, sharply delimited, irregular or rounded spots, whitish or ochraceous on the upper and brownish on the lower surface. The conidiophores are brown (paler towards the apex), geniculate, and 60 to 100 by 6 to 7 μ. The conidia are ellipsoidal. at first uni- and later triseptate, smooth, brownish, and 35 to 42 by 10 to 13 μ. *Ascochyta batatae* n.sp. forms on the leaves brownish, rounded or irregular spots up to 5 mm. in diameter. The pycnidia are 140 μ in diameter. The spores are oval, cylindrical, or occasionally slightly fusiform, at first continuous but later bicellular, and 6 to 10 by 3 μ. *Mycosphaerella bataticola* Khokhr. & Dyur. is regarded as a synonym of *M. ipomoeae*.

The bibliography appended comprises 357 titles.

ENDÔ (S.) & SAKITA (S.). **A new Sclerotium disease of Echinochloa crus-galli Beauv. subsp. submutica Honda var. typica caused by Sclerotium fumigatum Nakata.**—*Trans. Tottori Soc. agric. Sci.*, iv, 2, pp. 106–110, 2 figs., 1932. [Received September, 1935.]

Sclerotium fumigatum Nakata, the agent of a sclerotial disease of rice in Japan, was observed to be pathogenic also to a variety of *Echinochloa* [*Panicum*] *crus-galli*, on which positive results were given by inoculation experiments. The pale brown round or irregular sclerotia, with the under surface flat or rarely concave, measure 462 to 1480 by 370 to 1430 μ.

Nose (T.). **On the physiological specialization of Piricularia oryzae in Corea.**—*Ann. agric. Exp. Sta. Chosen*, vii, pp. 164–173, 1933. [Abs. in *Jap. J. Bot.*, vii, 3–4, p. (54), 1935.]

Attention is drawn to the differences in cultural behaviour on various nutrient media of a number of isolations of *Piricularia oryzae* [*R.A.M.*, xiv, p. 529 and next abstract] from diseased [rice] leaves in several parts of Korea, Formosa, and Tiba Prefecture, Japan. Evidence of physiological differentiation was afforded by the divergent degree of pathogenicity exerted by the various strains in inoculation experiments.

Tochinai (Y.) & Terui (M.). **On the injurious fungi which overwinter in the Rice straw.**—*Agric. & Hort.*, ix, 24 pp., 1934. (Japanese.) [Abs. in *Jap. J. Bot.*, vii, 3–4, p. (62), 1935.]

The following fungi were isolated from surface-sterilized fragments of overwintered rice straw in Hokkaidô, Japan: *Acremoniella atra*, *Alternaria oryzae*, *Epicoccum purpurascens* [*R.A.M.*, xii, p. 69], *Fusarium lateritium*, *F. merismoides* [ibid., xii, p. 412], *F. subulatum* [*F. avenaceum*: ibid., vii, p. 710], *Gibberella fujikuroi* [ibid., xiv, p. 254], *G. saubinetii*, and *Piricularia oryzae* [see preceding and next abstracts]. Inoculation experiments with all these organisms on rice seedlings showed that the three first-named are relatively innocuous, surviving the winter in Hokkaidô only under favourable conditions. The severe pathogenicity of the remaining species is well known, and with the exception of the last-named they can withstand the extremes of the local climate.

Suzuki (H.). **Studies on the influence of some environmental factors on the susceptibility of the Rice plant to blast and Helminthosporium diseases and on the anatomical characters of the plant. I. Influence of differences in soil moisture.**—*J. Coll. Agric. Tokyo*, xiii, 1, pp. 45–108, 2 pl., 1934. [Received June, 1935.]

A comprehensive, fully tabulated account is given of the writer's studies on the relation of soil moisture and anatomical differences to the reaction of rice to blast (*Piricularia oryzae*) [*R.A.M.*, xiii, p. 267, and preceding abstracts] and *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: ibid., xiv, p. 528.]

The results of inoculation experiments with *P. oryzae* on a resistant variety (Mubôaikoku), a susceptible one (Kairyôshinriki), and two upland sorts (Ôhatawase and Zairaishu) uniformly showed the susceptibility of rice to blast to increase in inverse ratio to the water content of the soil. Similar tests with *O. miyabeanus* on seedlings and adult plants gave comparable results to those obtained with *P. oryzae* in respect of the relation between susceptibility and soil moisture. Attention has already been drawn in the writer's earlier work to the correlation between resistance to *P. oryzae* and the extent of silicification of the epidermal cell walls of rice leaves, and a similar connexion was found to hold good also in the case of *O. miyabeanus*. The silica content of the leaves is located mainly in the dumb-bell-shaped cells (Reiszellen of Grob) of the upper part, which were found to be larger in the resistant plants grown on flooded than in the susceptible ones on arid

soils. A correlation was further established between resistance and the number of silicated short cells in the spike pedicel, which was larger in Mubôaikoku than in Kairyôshinriki. No significant relationship appears to exist between stomatal numbers and dimensions and reaction to *P. oryzae* and *O. miyabeanus*. To sum up, the susceptibility of rice to these diseases in arid soils seems to be partly due to the inhibition of normal development of the outer wall and of silicification, while the resistance of the Mubôaikoku variety is attributed in part to their development in a high degree.

MURRAY (R. K. S.). **Report of Botanist and Mycologist for 1934.**—*Rep. Rubb. Res. Bd Ceylon, 1934*, pp. 25–37, 1935.

The year 1934 was marked by an increased severity in Ceylon of *Oidium* leaf disease of *Hevea* rubber [*O. heveae*: *R.A.M.*, xiii, p. 801], not only at mid-country elevations, but also at the lower ones. Sulphur dusting was officially advised for mid-country estates, and is being adopted by numerous estates at all elevations in 1935. Dusting from the air by means of an autogiro is to be attempted, and the possibilities of applying sulphur to individual trees and groups of trees by means of rockets and bombs are being explored.

HIRATSUKA (N.). **Phragmidium of Japan.**—*Jap. J. Bot.*, vii, 3–4, pp. 227–299, 2 pl., 6 figs., 1935.

This is a copiously annotated and tabulated catalogue of 26 species of *Phragmidium*, including eight new ones, collected in various regions of Japan on ornamental Rosaceae. Fungus and host indexes and a bibliography of 72 titles are appended.

UPPAL (B. N.), PATEL (M. K.), & KAMAT (M. N.). **The fungi of Bombay.**—*Bull. Dep. Ld Rec. Agric. Bombay* 176 of 1934, viii+56 pp., 1 map, 1935.

In the introduction to this list of Bombay fungi it is stated that the number so far recorded for the Presidency is 593 compared with 2,351 enumerated by Butler and Bisby [*R.A.M.*, xi, p. 545] for the whole of India (25·2 per cent.). The fungi are arranged in alphabetical order under the chief systematic groups. Indexes of the hosts and genera of fungi, the scientific equivalents of the common names of the hosts, and a bibliography of 17 titles are appended.

STEMPELL (K. L.). **Studien über die Entwicklungsgeschichte einiger Entyloma-Arten und über die systematische Stellung der Familie der Sporobolomycetes.** [Studies on the life-history of some *Entyloma* species and on the systematic position of the family of the Sporobolomycetes.]—*Z. Bot.*, xxviii, 6, pp. 225–259, 1 pl., 9 figs., 1935.

The falcate conidia of *Entyloma calendulae* [*R.A.M.*, vi, p. 460] and *E. ranunculi* [ibid., vii, p. 432] were shown by the writer's cytological examination at Rostock University of material from *Calendula officinalis* and *Ranunculus ficaria*, respectively, always to contain only one haploid nucleus. They develop *in vitro* into a haploid mycelium which forms a fresh series of conidia which are vigorously discharged from their stalks. No indication of fusion between the falcate conidia or the mycelia arising therefrom could be detected. After some weeks in

culture on agar media the haploid mycelia of *E. ranunculi* and *E. calendulae* form haploid smut spores which once more develop into mycelia without the preliminary formation of promycelium or sporidia. From mixed platings of *E. calendulae* conidia and sporidia a diploid mycelium with clamp-connexions was obtained which produced typical smut spores. These germinate normally by means of a promycelium and sporidia, but after a time germination may become atypical, being associated with absence of caryogamy. The diploid mycelium of *E. calendulae* bore half-moon shaped, diploid conidia which were actively discharged in the same way as the falcate conidia ['basidiospores'] of *Tilletia tritici* [*T. caries*: ibid., xii, p. 777] and which on fresh media gave rise to a new diploid mycelium.

Derx (*Ann. mycol., Berl.*, xxviii, p. 1, 1930) subdivided into three genera, *Sporobolomyces*, *Bullera*, and *Tilletiopsis*, Kluyver's and van Niel's yeast group of the Sporobolomycetes (*Zbl. Bakt.*, Abt. 2, lxiii, p. 1, 1924), the distinguishing feature of which was its active discharge of aerial conidia [by the drop excretion mechanism]. This character, besides having been observed in *Entyloma*, is said also to occur in species of *Taphrina* [but cf. *R.A.M.*, iii, p. 108] and the author concludes from its occurrence in widely distant fungus groups that it is valueless as a taxonomic criterion.

NIETHAMMER (ANNELIESE). **Die Mucorineen des Erdbodens. Verbreitung, Leistungen und Beschreibung.** [The Mucorineae of the soil. Distribution, capacities, and description.]—*Z. PflKrankh.*, xlv, 5, pp. 241–280, 10 figs., 1935.

On the basis of her own studies on the Czecho-Slovakian, German, Swiss, Italian, and Jugo-Slavian soil microflora [*R.A.M.*, xii, p. 534; cf. also viii, p. 334; ix, p. 676], supplemented by a survey of the relevant literature, the writer gives notes on the distribution in Europe and elsewhere of twenty-seven species of *Mucor*, three of *Rhizopus*, four of *Absidia*, two of *Zygorrhynchus*, one each of *Phycomyces*, *Circinella*, *Cunninghamella*, and *Thamnidium*, and two of *Mortierella*.

Mucorineae in general, and *Mucor* spp. in particular, appear to be less common in southern than in north-central Europe. *M. racemosus* [ibid., xii, p. 191], which is not confined to the soil, may be regarded as practically ubiquitous, while *M. botryoides*, with its wide temperature range of 6° to 40° C., has been found in the very divergent climates of Alaska, Palestine, and Czecho-Slovakia. *Z. moelleri* [ibid., viii, p. 335] seemed from the present investigations to occupy the most diverse habitats and the longest north-to-south extension. Soils under vegetable crops are the most common sites of the Mucorineae, especially *M. racemosus*, in southern Europe, a count of 50,000 spores per kg. of soil being no rarity, while forests also contain large numbers, especially of *M. ramannianus* [ibid., xiii, p. 484]. The main function of the Mucorineae in the soil is doubtless the breaking-down of organic nitrogen compounds. A connexion has been traced between the soil Mucorineae and their presence on the corresponding crop plants, e.g., *M. racemosus* on lettuce, cabbage, and parsley leaves and *M. hiemalis* [ibid., xi, p. 554] on celery root-stocks, parsley roots, and beets, as well as in stored products and on seed. Further studies are in progress.

SERVAZZI (O.). **Sull' arrossamento fogliare del Kaki. (IIª Nota).** [On the leaf reddening of Persimmon. (2nd Note.)]—*Difesa Piante*, xii, 2, pp. 43–47, 1 fig., 1935.

In continuation of his previous communication [*R.A.M.*, xiv, p. 113] the author states that in January [?1934], under persimmon (*Diospyros kaki*) trees which during the preceding summer had exhibited the characteristic reddening described by him, he found fallen leaves, some of which bore acervuli of *Coryneum delleanii*, while others, when kept for eight days in a moist chamber at 18° C., developed pycnidia of a fungus which he refers to *Phoma kaki* Trav. & Spessa, not hitherto recorded from Italy. Attempts to reproduce the condition by inoculating persimmon leaves with the *C. delleanii* conidia or with the pycnospores produced in pure culture gave consistently negative results, suggesting the non-pathogenicity of the organisms to this host, and the probability that the reddening is of physiological origin.

Pimento.—*J. Jamaica agric. Soc.*, xxxix, 4, pp. 250–251, 1935.

The pimento [*Pimenta officinalis*] rust reported last year from Jamaica [*R.A.M.*, xiii, p. 653] has become increasingly prevalent, and is now present to a serious extent in all the larger pimento-growing areas. J. H. Faull confirmed F. E. V. Smith's opinion that the disease, which is still under observation, is new and at present unidentified.

ABBOTT (E. V.). **Economic importance of red rot and comparative susceptibility of some Sugar-Cane varieties in the southern United States.**—*Circ. U.S. Dep. Agric.* 350, 26 pp., 4 figs., 1935.

Since 1930 sugar-cane red rot (*Colletotrichum falcatum*) [*R.A.M.*, xiii, p. 728; xiv, pp. 257, 564], an almost constant source of loss to growers in the United States, has become even more serious than before in Louisiana owing to the widespread failure of P.O.J. 213, previously regarded as resistant.

Laboratory inoculation tests indicated that Purple, Ribbon, D-74, C.P. 807, and P.O.J. 213 were very susceptible; Co. 290, P.O.J. 36-M, C.P. 29/320, and Cayana susceptible; P.O.J. 36, P.O.J. 234, and C.P. 28/19 moderately susceptible; and Co. 281, C.P. 28/11, and C.P. 29/291 resistant.

In field inoculation experiments made by inserting a culture of the fungus into holes made in alternate internodes of the stalk, P.O.J. 213, P.O.J. 36–M, and C.P. 807 showed, on the whole, the greatest reductions in germination and yield of cane and sugar, only insignificant reductions being noted in P.O.J. 234, Co. 281, and Co. 290. Both Co. 290 and C.P. 807 are more resistant in the field than the laboratory tests would indicate, and this behaviour is attributed partly to their rapid germination and vigorous root development which prevents nodal infection. Heavy loss of stands due to red rot caused reduction in sucrose content and purity of the cane juice.

Melanconium [*Pleocyta*] *sacchari* [ibid., xiii, pp. 127, 595] caused significant reductions in the germination of C.P. 807, P.O.J. 213, P.O.J. 36-M, and P.O.J. 234, with corresponding losses in yield of cane and sugar in all these varieties except P.O.J. 234. *P. sacchari* is of

secondary importance in seed rotting. The presence of two species of *Fusarium* and one of *Basisporium* [*Nigrospora*] was noted in rotting seed cane, but these organisms are regarded as unimportant.

SAKUMA (I.) & MOMOSE (I.). **Studies on the colouring substances of the Cane sugar.**—*J. Soc. chem. Ind., Japan*, xxxviii B, 4, pp. 161–163, 1935.

In the course of studies on the injurious action of colouring substances in raw sugar-cane juice, the authors estimated the effect of red rot (*Colletotrichum falcatum*) [see preceding abstract] on the juice by means of a spectrophotometer. At P_H 7·0 the ratios of absorption at 4,720 Å to those at 5,900 Å were 1·886 and 2·64 for the red rot colouring matter and saccharetin (a brownish-red liquid from healthy canes), respectively.

GADD (C. H.). **Report of the Mycologist for 1934.**—*Bull. Tea Res. Inst. Ceylon* 12, pp. 22–25, 1935.

The most outstanding feature of the 1934 tea season in Ceylon [cf. *R.A.M.*, xiii, p. 540] was the mortality of the bushes caused by drought, especially in 'dry' localities.

A detailed study of *Poria* [*hypolateritia*: ibid., xi, p. 749] root disease in the field showed that, under the conditions prevailing at St. Coombs (where numerous diseased patches are present), the fact that no death has occurred in a patch for twelve months is not a safe indication that the fungus is no longer active in the soil. To determine whether a given area is free from the disease it is suggested that *Tephrosia vogelii* might first be planted, and if it reaches the flowering stage without becoming infected, it may safely be assumed that the area is free from the fungus. The use of closed bags for the transport of diseased material for destruction is strongly advocated, as infections frequently start from pieces of such material dropped on the road-sides.

On p. 56 of the bulletin it is stated that sulphur dust applied at the rate of 10 lb. per acre within two or three days of picking caused a very definite taint in made tea. This amount, however, is much more than would normally fall on tea during *Hevea* dusting against *Oidium* [*heveae*: see above, p. 654] and experiments are being made to determine the limit tea will tolerate.

CLAYTON (E. E.) & STEVENSON (J. A.). **Nomenclature of the Tobacco downy mildew fungus.**—*Phytopathology*, xxv, 5, pp. 516–521, 3 figs., 1935.

With a view to resolving the problem of the nomenclature of the tobacco downy mildew fungus, the name *Peronospora hyoscyami* being considered untenable, four collections of Spegazzini's herbarium material, dated 1888, 1896, 1897, and 1899 have been examined. Neither Adam, who proposed to rename the organism *P. tabacina* nor Wolf and collaborators who regard it as identical with *P. nicotianae* Speg. [*R.A.M.*, xiii, p. 602], are thought to have had access to these specimens [though Adam examined the 1897 material, cf. ibid., xiii, p. 132], the earliest collection of which is represented by the conidial stage while the others show oospores.

Two statements in Spegazzini's extended account of the disease (*Ofic. Quim.-Agric. Prov. Buenos Aires Bol.* 4, 1898) point to the identity

of *P. nicotianae* with the United States downy mildew, viz., its pathogenicity to numerous species of *Nicotiana* and a reputed resemblance to *P. hyoscyami*. On the other hand, the symptoms attributed to *P. nicotianae* do not markedly resemble those of the United States disease, the oospores of the fungus associated with which, moreover, are quite different from those of *P. nicotianae*, averaging 32 to 40 μ in diameter against 62 to 78 μ for the Spegazzini collections and 35 to 60 μ for *P. tabacina*, and agreeing with the latter species in the dark brown colour and in the pattern of the epispore. The conidia of Spegazzini's fungus are expressly stated to have germinated indirectly by means of zoospores, the formation of which, on the contrary, has never been observed by the writers in United States material. Attempts to obtain fresh material from the Argentine were unsuccessful as the disease has not been observed there for ten years at least. On the basis of the evidence at presence available, therefore, the authors recommend the use of the name *P. tabacina* for the agent of downy mildew in the United States, Adam's description of this species corresponding in essentials with the writers' specimens.

Van der Meer Mohr (J. C.). **Verslag van het Deli Proefstation over het jaar 1934.** [Report of the Deli Experiment Station for the year 1934.]—*Meded. Deli-Proefstat.*, Ser. 2, xcii, 47 pp., 1 graph, 1935.

The following items of phytopathological interest occur in this report. Extensive investigations by Jochems have shown that mosaic ('peh-sim') in tobacco seed-beds [*R.A.M.*, xiv, p. 473] may be controlled by thorough sanitation, including the clearing-up of diseased beds and destruction of the seedlings; speedy eradication and burning of isolated mosaic plants in the field; and the fencing-in of mosaic plots, all operations in which should be performed by special gangs of coolies, whose hands must be washed in 5 per cent. formalin immediately after dealing with infected material.

The results of experiments in the control of slime disease [*Bacterium solanacearum*: ibid., xiii, pp. 475, 659; xiv, p. 473] by liming were inconclusive, but some improvement was effected by light applications. Tests on tomato plants showed that double superphosphate increases the incidence of slime disease, while ammonium sulphate and sodium nitrate tend to reduce it (the latter only in the early stages of growth), as also to a lesser extent do potassium sulphate, double potassium carbonate, and tobacco ash. Slag dust also causes a heavy reduction in the percentage of infection. Guano was found to promote the development of the disease, an effect that was partially counteracted by the simultaneous use of slag dust or tobacco ash and largely obviated by a combination of both.

Trotter (A.). **Le malattie batteriche del Tabacco.** [Bacterial diseases of Tobacco.]—*Boll. tec. Tab.*, xxxii, 2, pp. 101–139, 3 pl., 11 figs., 1935. [English summary.]

A copiously annotated list is given of the bacterial diseases affecting tobacco, of which the following have been recorded in Italy: *Bacterium maculicola* [*R.A.M.*, vii, p. 558; x, p. 62]; *Bacillus phytophthorus* [ibid., xiii, p. 100] (of sporadic occurrence only); *B. carotovorus* [ibid.,

xiii, p. 274], observed by the writer on *Nicotiana rustica* near Cava dei Tirreni; *Bact. melleum* [ibid., x, p. 62], recently detected by Petri in Bolzano; *Bact. pseudozoogloeae* [ibid., xi, pp. 677, 766] on Levantine tobacco in Leccese; *Bact. solanacearum* [see preceding abstract] on Kentucky tobacco in Cologna, Venice; and *Bact. tabacum* [see next abstract] in the Venetian Alps and Trentino. The list is preceded by an introductory account of bacterial diseases and the diagnostic features differentiating them from virus infections and nutritional disorders (dystrophisms), and by an analytical key to the bacterioses; it is followed by a section on the control of the latter and by a three-page bibliography.

Böning (K.). **Versuche zur Bekämpfung des Wildfeuers an Tabak mit chemischen Mitteln.** [Experiments in the control of Tobacco wildfire with chemical preparations.]—*Prakt. Bl. Pflanzenb.*, xiii, 2, pp. 50–57, 2 figs., 1935.

A tabulated account is given of the writer's experiments (1928–33) at Munich in the control of tobacco wildfire [*Bacterium tabacum*] from which the beneficial effects of regular applications of Bordeaux mixture (1 or 2 per cent.) in the seed-bed and field are apparent [*R.A.M.*, x, p. 629]. In the seed-bed satisfactory results were also given by various other copper-containing mixtures, including the dusts cusisa [ibid., xiii, p. 418] and cupulvit [ibid., xii, p. 31]. Cusisa and nosperit were also generally effective in the field tests in which, however, the outcome of the different treatments varied according to the year. Lime-sulphur was not found to be altogether reliable.

Stanley (W. M.). **Chemical studies on the virus of Tobacco mosaic. III. Rates of inactivation at different hydrogen-ion concentrations.** —*Phytopathology*, xxv, 5, pp. 475–492, 1935.

The rate of inactivation of the tobacco mosaic virus [*R.A.M.*, xiv, p. 260] in diluted, untreated, infectious juice of Turkish tobacco held at 20° or —14° C. was shown by experiments [the results of which are fully discussed and the relevant statistical data tabulated] to be inappreciable between P_H 3 and 8, fairly rapid between P_H 1·5 and 2·5 and 9 and 10, and very quick from P_H 0·5 to 1·5 and 11 to 12. Similar results were obtained with purified preparations, except that the rate is somewhat higher at P_H 3 and rather lower between P_H 9 and 11.

Reactivation of virus completely inactivated at P_H 1, 2, 11, or 12 was not effected by readjusting to P_H 6·8. The reaction of *Nicotiana glutinosa* plants to the tobacco mosaic virus inoculated at a range of P_H 2 to 10·5 did not vary to any extent, but Early Golden Cluster beans (*Phaseolus vulgaris*) were much more susceptible to inoculation with the virus at P_H 9 to 10·5 than at 0·5 to 3.

The tobacco ring spot and cucumber mosaic viruses were found to be much less stable than that of tobacco mosaic, inactivation increasing with a rise or fall in the hydrogen-ion concentration from about P_H 6.

Spencer (E. L.). **Influence of phosphorus and potassium supply on host susceptibility to yellow Tobacco mosaic infection.**—*Phytopathology*, xxv, 5, pp. 493–502, 3 figs., 2 graphs, 1935.

The influence of phosphorus (up to 150 mg. per diem per plant of

potassium or ammonium dihydrogen phosphate) and potassium (up to 500 mg. potassium sulphate) on the growth and reaction of tobacco to yellow mosaic (Johnson's virus No. 6) was investigated on the lines of the author's previous studies with nitrogen [*R.A.M.*, xiv, p. 474]. The inoculations were again made by the pin-puncture method and susceptibility gauged by the number of lesions per 100 punctures.

In the phosphorus series susceptibility increased *pari passu* with growth and was apparently only indirectly connected with the nutrient supply, whereas with potassium a definite correlation could be traced between the amount given and the degree of susceptibility as well as the extent of growth. The development of the plants was promoted by small and medium doses, while susceptibility to yellow mosaic was increased by minute amounts but diminished by moderately larger ones. It is possible, therefore, to reduce susceptibility to yellow mosaic without retarding growth by the application of potassium in moderation.

NOLLA (J. A. B.). **Studies on disease resistance. I. A Tobacco resistant to ordinary Tobacco mosaic.**—*J. Agric. P.R.*, xix, 1, pp. 29–49, 8 pl., 1935.

The results of studies made in Porto Rico and at the Cornell and Wisconsin Universities showed that the Colombian Ambalema tobacco (*Nicotiana tabacum*), which in a recent communication (*J. Dep. Agric. P.R.*, xvii, pp. 301–303, 1933) was stated by him and Roque to be resistant to ordinary tobacco mosaic (Johnson's tobacco virus No. 1) [*R.A.M.*, xiv, p. 401], is susceptible to infection by inoculation at all stages of development. While plants inoculated when over four weeks old do not commonly show visible symptoms, seedlings and transplants inoculated at four weeks exhibit a clearing of the veins, followed by small chlorotic areas usually of a mild type. Later these plants apparently recover in the field and make normal growth, but their juices (as well as those of the older inoculated plants) always retain the virus, as shown by inoculations into Havana No. 38 tobacco and *N. glutinosa* plants. Quantitative studies (checked by statistical methods) indicated that Ambalema is significantly more resistant to tobacco virus No. 1 than is Havana No. 38, a factor in its resistance being apparently the inability of the virus to multiply in its tissues. A very similar type of resistance was also exhibited by this tobacco to yellow tobacco mosaic [tobacco virus No. 6: see preceding abstract] and to celery mosaic [ibid., xiv, p. 615], neither of which interferes significantly with its normal development. On the other hand, it was shown to be very severely affected by cucumber mosaic and yellow cucumber mosaic [ibid., xiv, p. 534], potato ring spot [ibid., xiv, p. 524], tobacco ring spot and spot necrosis, and to a somewhat lesser degree by potato mottle [see next abstract] and veinbanding viruses.

A mild form of ordinary tobacco mosaic was isolated from Ambalema plants inoculated with tobacco virus No. 1, and this remained constant on further inoculation; the virus appears to have properties similar to those of the original virus, of which it may possibly be an attenuated form [cf. ibid., xiv, p. 401].

JONES (L. K.) & BURNETT (G.). **Virous diseases of greenhouse-grown Tomatoes.**—*Bull. Wash. St. agric. Exp. Sta.* 308, 36 pp., 8 figs., 1935.

After referring to the considerable losses annually sustained by tomato growers in the State of Washington owing to virus diseases, and listing the tobacco virus diseases that are transferable to tomato, the authors give brief descriptive notes on eleven other local and foreign virus diseases that may be important in glasshouse-grown tomato crops.

Observations and tests made from 1928 to 1934 showed that the commonest virus troubles affecting tomatoes in the local greenhouses are mosaic (tobacco virus No. 1) [see preceding and next abstracts], mottle (potato latent virus), and streak (a combination of mosaic and mottle) [*R.A.M.*, xiv, p. 404]. These do not appear until after the plants have been handled during transplanting or pruning. The latent virus may be introduced into tomato plants by human agency following the handling of potato tubers, the maximum number of successful transfers by this means (8 per cent.) occurring after the removal of sprouts from tubers. Sixty-three hosts of tobacco mosaic are listed.

When young tomato plants were set at weekly intervals in soil that had previously grown streak-infected tomato plants it was found that they could become infected with tobacco mosaic even five weeks after the removal of the diseased plants, especially when the soil was kept moist.

The results of experiments on the longevity of the viruses in artificially infected material, placed in soil or stored in the greenhouse, showed that the tobacco virus No. 1 could remain infective in the streak-infected tomato tops and roots in soil for at least six weeks and probably as long as the tissue remained undecayed; the latent virus remained active for three weeks in two tests and for four weeks in the air-dried tissue. Only a very small percentage of tomato plants set in soil inoculated with tobacco mosaic contracted the disease [ibid., ix, p. 207].

Tests showed that mottle, mosaic, and streak may reduce the yield of tomato fruits by 1·8, 15, and 44·4 per cent., respectively.

SHAPOVALOV (M.) & DUFRÉNOY (J.). **Cytologische Beobachtungen an einer Viruskrankheit vom Typus 'streak' oder 'Strichel'.** [Cytological observations on a virus disease of the 'streak' or 'Strichel' type.]—*Phytopath. Z.*, viii, 3, pp. 297–301, 8 figs., 1935.

Tobacco plants inoculated with material from a tomato affected by 'combination streak', a mixture of Johnson's tobacco mosaic virus No. 1 and virus X (the latent potato mosaic virus) [*R.A.M.*, xiii, p. 278; xiv, p. 261, and preceding abstract], developed the same external symptoms as those induced by virus No. 1 alone, while the cytological reactions were also identical. The mitochondria divide very rapidly and many form starch by conversion into amyloplasts; vacuolated, striated, and plate bodies are formed in the cytoplasm. The virus No. 1 from streak also caused typical reactions on *Nicotiana glutinosa*. Starch formation and vacuolization are followed by plasmolysis, the cells surrounding the

central necrotic zone surviving long enough to form phenol-like substances in some of their vacuoles. A correlation is believed to exist, in virus as in parasitic diseases, between the capacity for rapid and abundant phenol production and the limitation of pathogenic extension.

AINSWORTH (G. C.). **Virus diseases (1).**—*Rep. exp. Sta. Cheshunt, 1934*, pp. 60–66, 1935.

During 1934 *Hippeastrum calceolaria, Richardia* [*Zantedeschia aethiopica*: *R.A.M.*, xiv, p. 366], and *Schizanthus* were noted as hosts of tomato spotted wilt [ibid., xiv, p. 610] which was also recorded for the first time from Jersey and Guernsey.

Of 26 samples of American and Empire tobacco smoked by the staff at Cheshunt 23 showed the presence of a virus, which in all cases except one, where it was not identified, was that of tomato mosaic (tobacco virus No. 1) [cf. ibid., xiv, p. 262 and preceding abstracts].

KADOW (K. J.) & SHROPSHIRE (L. H.). **Tomato diseases and insect pests : identification and control.**—*Circ. Ill. agric. Exp. Sta.* 428, 36 pp., 13 figs., 1935.

Popular notes are given on some well-known diseases of tomatoes and their control in Illinois, with supplementary sections on soil sterilization methods [*R.A.M.*, xiv, p. 460] and on fungicides.

ORCHARD (O.). **The effect of sulphur vaporization on Tomato leaf mould.**—*Rep. exp. Res. Sta. Cheshunt, 1934*, p. 80, 1935.

Experiments at Cheshunt designed to control tomato leaf mould [*Cladosporium fulvum*: *R.A.M.*, xiii, p. 76] by treatment with vaporized sulphur (on 5th June, before infection appeared, and thereafter at intervals of 14 days) gave entirely unsuccessful results, the disease appearing within about ten days and spreading rapidly over all the plants [ibid., vii, p. 749].

LYUBARSKY (L. V.). Материалы по грибным болезням леса и разрушителям древесины в южно-уссурийском крае. [Contribution to the knowledge of fungal diseases of forest trees and timber rots in the south Ussuri region.]—*Bull. far-east. Br. Acad. Sci. U.S.S.R.*, Vladivostok, *1934*, 9, pp. 76–104, 16 figs., 1934. [English summary. Received July, 1935.]

The author states that, owing to the local warm and damp climate, coniferous and broad-leaved forests, especially in low-lying, periodically flooded areas, in the southern Ussuri river basin suffer considerable damage from parasitic and wood-destroying fungi. Among the 89 species (brief descriptions of which are given) which were collected from 1929 to 1931, the economically most important ones are *Trametes pini* [*R.A.M.*, xiii, p. 666], responsible for the killing of 70 per cent. of the trees in many stands of *Picea ajanensis* [*P. jezoensis*] and *Pinus koraiensis*, and *Fomes igniarius* [ibid., xiii, p. 604] which attacks many broad-leaved species and is particularly prevalent on the Manchurian walnut (*Juglans manshurica*). The paper terminates with a list of the

fungi arranged in systematic order, with the indication of the hosts and substrata on which they were found.

ORLOŚ (H.). **Sprawozdanie z działalności Instytutu Badawczego w dziedzinie fitopatologji za rok 1933.** [Report on the phytopathological activity of the Research Institute in 1933.]—*Trav. Inst. Rech. For. doman. Varsovie*, Ser. A, 11, pp. 7–19, 1 pl., 5 maps, 1935. [French summary.]

In this report the author gives brief notes on the distribution and intensity of various major diseases of forest trees in Poland in 1933, illustrated by maps in the case of *Lophodermium pinastri* [*R.A.M.*, xii, 604], *Trametes pini* [see preceding abstract], *T. radiciperda* [*Fomes annosus*: ibid., xiii, p. 738], *Armillaria mellea*, and *Melampsora pinitorqua* [ibid., x, p. 418]. In general, surveys in that year showed that the phytosanitary condition of the Polish forests is very unsatisfactory.

Forest disease control in New England.—*J. For.*, xxxiii, 5, pp. 469–473, 1935.

In this report of the New England Section of the Society of American Foresters notes are given on certain problems of forest pathology that have come into prominence during recent years. These include the *Nectria* cankers of beech and other hardwoods and of walnut [*R.A.M.*, xiv, pp. 338, 407]; *Stereum gausapatum* causing heart rot of oak [ibid., xi, p. 497; xiii, p. 810] and *S. sanguinolentum* attacking conifers [ibid., ix, p. 79]; leaf cast of red pines [*Pinus resinosa*] due to *Lophodermium pinastri* [see preceding abstract] in Massachusetts nurseries; and Dutch elm disease (*Ceratostomella ulmi*) [ibid., xiv, p. 537].

DAVIDSON (R. W.). **Forest pathology notes.**—*Plant Dis. Reptr*, xix, 7, pp. 94–97, 1935. [Mimeographed.]

Notes are given on *Stereum gausapatum* [see preceding abstract], shown by recent investigations in Virginia, New Jersey, and Pennsylvania to be probably the most important of all the fungi causing butt rot of sprout oak, the black and scarlet [*Quercus velutina* and *Q. coccinea*] suffering much more severely than the chestnut [*Q. prinus* L.] and white [*Q. alba*]. 'Brown oak' is caused by *Fistulina hepatica* [*R.A.M.*, iv, p. 135; cf. xiv, p. 414], the greyish-brown ('tortoiseshell') mottling produced by which is stated by P. Groom (*Quart. J. For.*, xiv, p. 103, 1920) to be of value in furniture manufacture. The *Ptychogaster* stage is readily formed on potato-dextrose or malt extract agar after about six weeks at room temperature. *Paecilomyces varioti* [*R.A.M.*, xiii, p. 97] is a common concomitant of the brown oak condition.

Rhizina inflata [*R. undulata*: ibid., xii, p. 798] was observed fruiting on the soil in a Maryland nursery where red pine [*Pinus resinosa*] seedlings were found by C. Hartley to be dying off, probably as a result of infection by the fungus.

Gonatorrhodiella parasitica Thaxter was found parasitizing *Trichoderma lignorum* [ibid., xiv, p. 551].

Birch (*Betula nigra*) seeds were observed to be infected by a fungus identified by Miss E. K. Cash as *Sclerotinia betulae* [ibid., iv, p. 199].

WESTERDIJK (JOHANNA). **Kort verslag van de onderzoekingen over de Iepenziekte, verricht in het Laboratorium Willie Commelin Scholten, gedurende 1934.** [A brief report on the investigations on the Elm disease conducted in the Willie Commelin Scholten Laboratory during 1934.]—*Tijdschr. PlZiekt.*, xli, 5, pp. 101–103, 1935.

The writer briefly indicates the lines of research pursued during 1934 in connexion with the study of the elm disease caused by *Graphium* [*Ceratostomella*] *ulmi* in Holland, an extended account of which is given in the next abstracts.

BUISMAN (CHRISTINE). **Verslag over de onderzoekingen betreffende de Iepenziekte, verricht in het Phytopathologisch Laboratorium 'Willie Commelin Scholten' te Baarn, gedurende 1934.** [Report on the investigations relating to the Elm disease conducted in the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, during 1934.]—*Tijdschr. PlZiekt.*, xli, 5, pp. 104–120, 4 pl., 1935.

Some 30,000 elms were uprooted in Holland on account of infection by *Graphium* [*Ceratostomella*] *ulmi* [see preceding and next abstracts] in 1934, as compared with 70,000 in the previous year [*R.A.M.*, xiii, p. 548]. The writer's general impression was that the disease was less severe in 1934 than in 1933. Nine more cases were reported from the Wadden islands. Notes are given on the distribution of *C. ulmi* in foreign countries [ibid., xiv, p. 264].

Growers were supplied with material from seedlings selected for resistance to *C. ulmi* with the proviso that no commercial use should be made of the resultant grafts before the end of 1935. Promising results were again given in the inoculation experiments with the Asiatic varieties, *Ulmus wallichiana* and *U. pumila* and its var. *pinnato-ramosa*. *U. wilsoniana*, ordinarily highly resistant, proved susceptible in this series of trials. *U. laciniata nikkoensis*, *U. macrocarpa*, and the Karagatch elm also reacted positively to the fungus in a number of cases, especially at Utrecht, though they are definitely less susceptible than the native elm. *U. japonica* again showed moderate susceptibility. Among the European varieties, a few individuals of *U. glabra* appear to be practically immune from infection. *U. procera berardi* is resistant but unsuited for extensive cultivation by reason of its slow and sparse growth. *U. foliacea sowerbyi* and *U. hillieri* failed to maintain their early promise.

An anatomical study of wood naturally and artificially infected by *C. ulmi* revealed an accumulation of starch in the parenchyma cells of the latest formed annual rings both above and below the site of infection, a phenomenon observed also in infections with *Verticillium albo-atrum*.

BUISMAN (CHRISTINE). **Het Iepenziekte-probleem in Italie.** [The Elm disease problem in Italy.]—*Ned. Boschbouw-Tijdschr.*, viii, 5, pp. 179–180, 1935.

Since the writer's previous note on the ravages of the elm disease (*Graphium* [*Ceratostomella*] *ulmi*) in the province of Emilia, Italy [*R.A.M.*, xii, p. 734, and preceding abstract], a determined effort is

stated to have been made to replace the susceptible European field elm [*Ulmus campestris*] by the highly resistant *U. pumila* (?) *pinnato-ramosa* [ibid., xiii, p. 549]. Thus, in April, 1935, a Bologna nurseryman is reported to have delivered 1,000,000 runners and seedlings of the latter for planting in the affected areas. *U. pumila* (?) *pinnato-ramosa* has so far proved very satisfactory both as a support for vines and as fodder for livestock. *Nectria cinnabarina*, which hampers the cultivation of *U. pumila* in Holland [cf. ibid., x, p. 348], is apparently not a limiting factor in Italy.

ROEPKE (W.). **Kort verslag over het Iepenziekteonderzoek verricht aan het Laboratorium voor Entomologie der Landbouwhoogeschool gedurende het jaar 1934.** [A brief report on the Elm disease investigation conducted at the Entomological Laboratory of the Agricultural College during the year 1934.]—*Tijdschr. PlZiekt.*, xli, 5, pp. 121–124, 1935.

In this report of work carried out by J. J. Fransen, the following points are of interest. A method was devised of contaminating elm-bark beetles (*Scolytus scolytus* and *S. multistriatus*) with *Graphium* [*Ceratostomella*] *ulmi* spores for use in infection trials on resistant varieties [see preceding abstracts]. Little difference was observed between the natural infection transmitted by beetles and that artificially produced by injections into the tree.

The presence of the mite *Pseudotarsonemoides innumerabilis* [cf. *R.A.M.*, xiv, p. 63] was found to promote the fructification of *C. ulmi* in the *Scolytus* nymphal chamber.

The practical value of trap trunks in the control of the bark beetles is reported to have been demonstrated.

SERVAZZI (O.). **Contributi alla patologia dei Pioppi. II. La 'tafrinosi' o 'bolla fogliare' dei Pioppi.** [Contributions to the pathology of Poplars. II. 'Taphrinosis' or 'leaf blister' of Poplars.]—*Difesa Piante*, xii, 2, pp. 48–62, 3 figs., 1935.

This is a brief account of the author's observations on the poplar leaf blister (*Taphrina aurea*) [*R.A.M.*, x, p. 418] in 1933 and 1934 in Piedmont, including some notes on the symptoms of the disease and on the morphology of the causal organism, together with its full synonymy. In indicating the wide range of poplar species which have been recorded as hosts of the fungus in literature, it is stated that in Piedmont leaf blister was only seen on *Populus nigra*, *P. pyramidalis*, and the Canadian and Carolina poplars [*P. canadensis* and *P. deltoides*], infection being very limited on all four species in 1933, but very severe and widespread on the two last-named species in 1934, while still slight and rare on the other two. *P. alba* remained immune from the disease in both years, even when growing in close proximity to severely diseased trees of the other species. This is considered to give some support to the view expressed by certain earlier workers that *T. aurea* includes more than one physiologic form, specialized to different species of poplar. A bibliography of 70 titles is appended.

MEGINNIS (H. G.). **Losses of Black Locust planting stock in storage.**—*J. For.*, xxxiii, 5, pp. 534–535, 1935.

Black locust [*Robinia pseud-acacia*] planting stock stored in heavy soils in Marshal County, Missouri, is stated to be liable to a rank growth of [unspecified] moulds, covering the buried portions so that the roots decay within a few days. The bark and cambium around and above the root collar are also rotted, the seedlings often being entirely girdled. Unusually severe losses from this source occurred during a warm, damp spell early in April, 1934, necessitating the rejection of fully 50 per cent. of the stock. Heeling the stock in loose sand, 1 ft. or more in depth, seems to afford adequate ensurance against such losses.

TUBEUF [C. v.]. **Ausführung der organisierten praktischen Bekämpfung des Blasenrostes fünfnadeliger Kiefern.** [The execution of the organized practical control of blister rust of five-needled Pines.]—*Z. PflKrankh.*, xlv, 5, pp. 297–301, 1935.

Suggestions are made for the organization of the campaign proposed by the writer for the extermination in Germany of the white pine (*Pinus strobus*) blister rust (*Cronartium ribicola*) [*R.A.M.*, xiv, p. 541]. In addition to the prohibition of trading in seed and seedlings of *P. strobus*, *P. monticola*, and *P. peuce*, and the systematic destruction of diseased material, the regulations must include the eradication of black currants, *Ribes aureum*, and other susceptible varieties [ibid., xiii, p. 136]; on the other hand, the absolutely immune Red Dutch currant [ibid., xiv, p. 377] may be planted with impunity.

WAŁEK-CZERNECKA (ANNA). **Grzyby na placach tartacznych.** [Fungi in sawmills.]—*Trav. Inst. Rech. For. doman. Varsovie*, Ser. A, 12, pp. 25–40, 1935. [French summary.]

The author lists 52 species of wood-destroying fungi which were collected by her in Poland in 1933 in the premises of four State sawmills, the records from each sawmill being indicated. While admittedly not exhaustive, this list includes all the species that are known to cause severe rotting of constructional and other timbers, and suggests that much of the infection of building timber occurs in sawmills either during storage or during processing. Preventive and control measures based on plant hygiene at the sawmills are very briefly discussed.

WRIGHT (E.). **Trichosporium symbioticum n.sp., a wood-staining fungus associated with Scolytus ventralis.**—*J. agric. Res.*, l, 6, pp. 525–538, 7 figs., 1935.

A morphological and cultural account is given of a wood-staining fungus which is considered to be new to science and is named *Trichosporium symbioticum*, with Latin and English diagnoses. It was found frequently in the galleries of the engraver beetle *Scolytus ventralis* in white firs (*Abies concolor*) throughout the Sierra Nevadas in California. The fungus is characterized by septate, hyaline to brown, intercellular hyphae, averaging 3 μ in width. The conidiophores are simple or branched, hyaline, 1 to 1·5 μ thick, and bear clusters of terminally or subterminally attached, hyaline, subglobose to ovoid spores, 1·8 to

2·4 μ in diameter. On malt agar the fungus forms a white, flocculent aerial mycelium, bearing erect conidiophores 1·5 to 2 μ thick, with spores 1·5 to 4 μ in diameter, and a submerged mycelium at first hyaline but later cinnamon-drab to fuscous brown.

Special tests showed that the engraver beetles carry the fungus on the surface of the body, rarely in the digestive tract, and that the fungus is definitely pathogenic to the white fir, killing the cambium as it advances. There is some evidence that the relationship of the beetle and fungus may be symbiotic, the beetle benefiting by the lessened resistance of the tree and the fungus by being carried to new substrata by the insect.

CAMPBELL (W. G.) & WIERTELAK (J.). **The chemistry of the white rots of wood. IV. The effect on wood substance of Ustulina vulgaris Tul.**—*Bio-chem. J.*, xxix, 6, pp. 1318–1321, 1935.

Ustulina vulgaris has been found by chemical analysis at the Forest Products Research Laboratory, Princes Risborough, to induce by its parasitic action on lime (*Tilia vulgaris* Heyne) wood decomposition of the 'white rot' type [cf. *R.A.M.*, xii, p. 343]. Both lignin and carbohydrates are attacked and alkali-solubility, calculated as a percentage of sound wood, steadily decreases as decay advances. In the 'red wood' zone, between the sound and diseased areas, a loss of approximately 4·6 per cent. of the wood substance was sustained and accounted for almost in its entirety by depletion of the 'Cross and Bevan' cellulose. At the most advanced stage of rotting examined about one-third of the cellulose and one-quarter of the lignin were decomposed, while exhaustion of the furfuraldehyde-yielding complexes was also pronounced.

The saprophytic action of *U. vulgaris* on beech wood [ibid., xiii, p. 809], though slow, was similar. Experimental data obtained from decayed lime wood indicate that the fungus must markedly impair the mechanical properties of its host.

GEWECKE (F.) & KÄRST (O.). **Vergleichende Versuche mit Holzschutzmitteln (Feuer, Fäulnis und Schädlingsfrass).** [Comparative experiments with wood preservatives (fire, decay, and insect depredations).]—*Angew. Chem.*, xlviii, 19, p. 272, 2 graphs, 1935.

The writers' tests are stated to have shown that 'Xylamon-Feuerschutz', containing besides fire-repellent constituents a high proportion of chlorinated naphthalenes, affords excellent protection against wood-destroying fungi and insects [cf. *R.A.M.*, xiii, p. 138].

Treating ties with Z.M.A.—*Rly Engng Maint., 1935*, 4, pp. 228–229, 1935.

During the period of the depression it was necessary as far as possible to replace the creosote-petroleum treatment of railway sleepers [*R.A.M.*, xiv, p. 545], which costs 20 to 25 cents more per sleeper than zinc chloride or zinc-meta-arsenite [ibid., xi, pp. 84, 686], by the two latter preservatives on the Great Northern Railway, United States. In 1932 the number of sleepers treated with zinc-meta-arsenite was 290,680, the corresponding figures for 1933 and 1934 being 231,162

and 198,830, respectively, compared with an average of treated sleepers for the last ten years of 1,560,000. Nearly all the wood impregnated with zinc-meta-arsenite from 1932 to 1934 was western larch [*Larix occidentalis*]. Both the empty- and full-cell processes were used, the minimum net retention of dry disinfectant being $\frac{1}{6}$ lb. per cu. ft. of wood. The strength of the preservative solution was 1·65 per cent. and the temperature during impregnation ranged from about 70° to 80° F.; the average treating time per charge was ten hours. Sleepers thus treated in a test plant in 1930 were unaltered by 1934.

Zinc-meta-arsenite has also been extensively used of recent years for the treatment of telegraph poles on the Great Northern Railway (14,246 Douglas fir [*Pseudotsuga taxifolia*] from 1930 to 1932, inclusive), a full-length pressure impregnation being given with a minimum net retention of $\frac{1}{4}$ lb. dry zinc-meta-arsenite per cu. ft. These poles were also found to be in good condition in 1934.

RUDGE (E. A.). **The decay of wood and the formation of coal.**—*J. Soc. chem. Ind., Lond.*, liv, 21, pp. 499–501, 1935.

In connexion with a discussion of the processes involved in coal formation, the writer briefly summarizes the results of his recent investigations, from a chemical angle, on the related phenomenon of timber decay [*R.A.M.*, vii, p. 195; xiv, p. 542]. The latter has been found to occur only in the presence of moisture in quantity compatible with a condition of ionic conductivity. For all woods examined this minimum moisture content is about 20 per cent. of the dry weight. Decay is uniformly attended by an enhanced content of mineral matter, due to one of three factors, (1) organic depletion by micro-organisms, (2) ionic migration of the inherent mineral matter of the wood towards the affected region, and (3) infiltration of mineral matter from some external source. Of all the inorganic ions normally present under conditions of natural decay, the bicarbonate is specific in relation to the phenomenon, the importance of the cation lying solely in the provision of a soluble bicarbonate, for which purpose the calcium, iron, and magnesium cations are indicated.

The function of the bicarbonate ion in causing the incipient degradation of the woody tissue is so far a matter of analogy and conjecture, but there are good grounds for believing it to be parallel to the behaviour of the thiocarbonate ion in the chemistry of viscose. It is apparent that the cellulose constituent of the wood is primarily affected, and the complex formed is readily oxidized. Cellulose degradation is ordinarily a slow process, which may be accelerated, however, by the use of high concentrations of bicarbonates under pressure and at temperatures of 60° to 80° C. The subsequent tissue wastage by fungal and bacterial invasion may, under favourable conditions, rapidly eclipse the primary effects of infiltration. An analysis of the cellulose, lignin, and mineral matter values of a peat profile suggests the occurrence of infiltration from the floor of the deposit upwards, producing a general effect of great similarity to that associated with wood decay. The position of lignin in the scheme of humification is problematical. During the earlier stages of wood decay the lignin constituent shows no alteration either in total content or in chemical character, but there is definite

indication of depletion in the later phases. It would seem, therefore, that cellulose and lignin are in equilibrium capable of adjustment during depletion by decay.

SMITH (K. M.). **A virus disease of cultivated Crucifers.**—*Ann. appl. Biol.*, xxii, 2, pp. 239–242, 2 pl., 1935.

A brief account is given of a disease which was first noticed in the autumn of 1934 in the vicinity of Cambridge on a number of cabbages, Brussels sprouts, and other *Brassica* spp., characterized on the older leaves by uniformly distributed, almost black, deeply sunken necrotic rings; in smaller plants the necrosis may take the form of circular or irregular lesions. The trouble was shown to be transmissible to cabbage by sap transfusion and to be carried in the field by the aphid *Myzus persicae*. It was also easily transmitted by inoculation to *Nicotiana glutinosa*, *N. langsdorfii*, and White Burley tobacco, the symptoms on which are briefly described. Preliminary comparative tests show that the virus associated with the condition is different from those of tomato spotted wilt [see above, p. 662] and cabbage mosaic [*R.A.M.*, ix, p. 572; cf. also XIV, p. 207], the latter of which is widespread in the Cambridge district. Further work is in progress to determine the effect of the virus on certain other cruciferous crops.

WHITEHEAD (T.). **A note on 'brown heart', a new disease of Swede, and its control.**—*Welsh J. Agric.*, xi, pp. 235–236, 1935.

'Brown heart' of swedes [*R.A.M.*, xiv, p. 558] recorded in Ireland in 1913, was first observed in north Wales in November, 1932, and in the last two years has also been reported from Scotland and England. No variety appears to be immune [cf. ibid., xiv, p. 70], though there is a wide range of varietal susceptibility. In tests on four farms borax applied at the rate of 10 lb. per acre reduced infection to 0, 13 (1·3 per cent. badly diseased), 8 (1·3), and 9 (2) per cent., respectively, as compared with 36, 55, 29, and 37 per cent. in the corresponding untreated control plots. No further improvement resulted from doubling this rate of application.

HARTER (L. L.), ANDRUS (C. F.), & ZAUMEYER (W. J.). **Studies on Bean rust caused by Uromyces phaseoli typica.**—*J. agric. Res.*, l, 9, pp. 737–759, 4 graphs, 1935.

After a brief account of the distribution and economic importance of bean (*Phaseolus vulgaris*) rust (*Uromyces phaseoli typica* Arthur) [*U. appendiculatus* Fr.: *R.A.M.*, xiv, p. 416] in the United States, the authors give details of experiments the results of which showed that the rust may be made to complete its life-cycle in the greenhouse. Besides the common strain which freely produced teleutospores, a slight admixture was found in some collections of a second strain which, although morphologically indistinguishable from the first, never formed teleutospores and also differed in its pathogenicity to certain bean varieties. The abundance and time of formation of teleutospores in the first strain was found to be controllable by modifying the metabolism of the host [ibid., vii, p. 531]. Teleutospores were shown to be still viable at the end of 182 days, and germination of uredospores was

obtained at the end of 26 but not of 28 weeks after formation. The optimum temperature for the germination of the uredospores was about 14·5° C., and that for infection approximately 17°. Under controlled conditions no infection resulted when the inoculated plants were kept at a relative humidity below 95 per cent. Infection to be successful appeared to require the presence of condensation water or an initial excess of water on the plants. There was evidence that environmental conditions unfavourable for the growth of the host also delay or reduce infection.

Resistance tests of 61 varieties of garden and field beans showed that even the most resistant varieties show a trace of rust under very favourable conditions. Only two pole varieties (Lazy Wife and King Mammoth Horticultural) showed any marked degree of resistance, while seven out of eighteen field varieties showed sufficient resistance to deserve recommendation in localities subject to rust epidemics. All the American commercial varieties of Lima bean (*P. lunatus macrocarpus*) which were tested, except Wood Prolific, Sieva, and Henderson, were highly susceptible.

The investigations indicate that outbreaks of bean rust are possible in regions where a relative humidity of 95 per cent. or over is maintained for any period of eight consecutive hours or more. Preliminary tests suggested sulphur dusting as an effective means for the control of the rust.

REICHELT (K.). **Anbauversuche mit Buschbohnen.** [Cultivation experiments with Bush Beans.]—*Obst- u. Gemüseb.*, lxxxi, 4, pp. 60–61, 1935.

Among the characters taken into account in a series of field experiments carried out in the Hanover district of Germany from 1926 to 1929 with 19 white-seeded, green-podded bean [*Phaseolus vulgaris*] varieties in comparison with the dark-seeded, stringless Geneva Market was reaction to anthracnose [*Colletotrichum lindemuthianum*: *R.A.M.*, xiii, pp. 318, 741]. Highly susceptible to this disease were Kaiser Wilhelm, Kaiser Wilhelm Riesen [Giant], Nordstern, and Schlachtschwert; moderately so, Hinrichs Riesen stringless, Weisse Treib [White Forcing], and Early White Zucker Brech; while comparative resistance was shown by White Flageolet, Hinrichs Riesen (white ground), Zucker Perl Perfektion, Alpha, Ilsenburg White, White Kidney, Volgers Perl, Zucker Perl Prinzess, Holsteiner, Konserva, and Zucker Butter Brech.

TOMPKINS (C. M.) & GARDNER (M. W.). **Relation of temperature to infection of Bean and Cowpea seedlings by Rhizoctonia bataticola.**—*Hilgardia*, ix, 4, pp. 219–230, 2 figs., 1935.

In the experiments briefly reported in this paper the authors compared the response to temperature in culture of the strain of *Rhizoctonia bataticola* (*Macrophomina phaseoli*) responsible for the seedling stem blight of beans (*Phaseolus vulgaris*) in California [*R.A.M.*, xiii, p. 344] with that of strains isolated from sugar beet, cowpea, sweet potato, begonia, citrus, strawberry, cotton, of Haigh's A (*R. lamellifera*) [ibid., xiv, p. 233], B, and C (*M. phaseoli*) strains, and of *R.* [*Corticium*] *solani*. None of the organisms produced pycnidia, and all, with the exception

of Haigh's A and B strains, formed small sclerotia, being therefore referable to Haigh's C (*M. phaseoli*) group [ibid., xiv, p. 561]. Except the citrus strain which grew only about half as rapidly as the others and had a lower temperature optimum (28° C.), all the strains developed at temperatures from 25° to 34°, with an optimum at about 31°.

The pathogenicity of the strains to bean and cowpea seedlings was tested at temperatures ranging from 20° to 40°; the results showed that with the exception of the citrus and Haigh's A [loc. cit.] and B strains, all the isolations were pathogenic to beans at all the temperatures, high percentages becoming infected at 31°, 34°, and 37°, and that all strains attacking the bean (except the begonia strain) were also pathogenic to cowpea, although some differences in degree of pathogenicity were noted. The cowpea strain was distinctly the most pathogenic to cowpea seedlings. Most of the infection of both beans and cowpeas occurred on the cotyledons. *C. solani* was shown to be pathogenic to both hosts at the lower temperatures, and attacked the cotyledons to a considerable extent.

OTOMO (S.). **The molds growing on Soybean cakes.**—*J. agric. chem. Soc. Japan*, xi, pp. 124–146, 1935. [Abs. in *Chem. Abstr.*, xxix, 13, p. 4406, 1935.]

Eight varieties of *Aspergillus*, three of *Penicillium*, *Monilia* sp., and *Sphaerella* sp. were isolated from mouldy soy-bean cakes [cf. *R.A.M.*, xii, p. 593]. Among them were found *A. herbariorum* var. *minor*, *A. repens*, *A. amstelodami* [ibid., x, p. 597], and *P. waksmani* Zaleski. The organisms, when grown on soy-bean cakes with a water-content of 31·63 per cent., caused a decrease in the quantities of fat, soluble carbohydrates, and water, while the amount of total nitrogen remained constant. Mouldy soy-bean cake containing 7·83 per cent. ash, 55·10 per cent. crude protein, 6·86 per cent. crude fat, 7·90 per cent. crude fibre, and 15·82 per cent. soluble carbohydrates (dry weight) was added to the ration for white rats with a favourable effect on the health of the animals [cf. ibid., xiv, p. 603].

HAENSELER (C. M.). **Damping-off of seedlings controlled by new method of using formaldehyde.**—*Agric. News Lett.*, iii, 5, pp. 7–8, 1935.

Preliminary tests conducted in New Jersey in 1929 showed that beet damping-off [largely due to *Pythium ultimum* and *Corticium solani*: *R.A.M.*, xiii, p. 644] could be almost completely eliminated by sprinkling the beds immediately after, or within a few hours of seeding with 1 part formalin (38 to 40 per cent. formaldehyde) in 200 parts of water at the rate of 1½ pints per sq. ft. of soil surface. During the past five years this treatment has given consistently excellent results in commercial greenhouses. Used at a strength of 1 in 300 it has also controlled satisfactorily damping-off of cucumber, melon, peas, tomato, eggplant, and pepper [*Capsicum annuum*].

WILHELM (A. F.). **Die Gelbfleckigkeit des Spinats ('Spinatkrankheit').** [Spinach mosaic ('Spinach disease').]—*Obst- u. Gemüseb.*, lxxxi, 4, pp. 56–58, 2 figs., 1935.

The losses from spinach mosaic in the foothills between Cologne and Bonn in 1934 are estimated at 70 to 80 per cent. of the crop [*R.A.M.*,

x, p. 219]. Under local conditions cucumbers are the most important alternate host of the virus, which readily passes from them to spinach and vice versa. The supposed resistance to mosaic of the Viroflay, Riesengaudry, Juliana, and Victoria varieties has not been maintained, their susceptibility being equal to that of the locally popular Rhenish Giant; Virginia Savoy blight-resistant, on the other hand, is practically immune. Direct control of the aphid vectors of the disease being economically impracticable, it is necessary either to exclude spinach from the fields during the period of reproduction and spread of the insects, or to plant the crop at such times that it is no longer exposed to infection at the season of aphid activity. To this end winter spinach should be sown as late and the summer crop as early as possible. Diseased plants should be eradicated and the fields broken up after harvesting, while proximity of spinach to cucumber is to be avoided.

Destructive Insect and Pest Acts, England. The Fruit Tree Pests (Buckinghamshire) Order of 1935. Dated May 24, 1935.—4 pp., 1935.

As from 3rd June, 1935, the Local Authority for the Administrative County of Buckingham or the Borough of Chipping Wycombe, as the case may be, is authorized to order the inspection and, if necessary, the treatment of any apple and pear trees for scab [*Venturia inaequalis* and *V. pirina*: *R.A.M.*, xiv, p. 336].

Legislative and administrative measures. Sweden.—*Int. Bull. Pl. Prot.*, ix, 5, pp. 115–116, 1935.

As from 12th October, 1934, phytosanitary certificates will be issued by the Swedish Plant Protection Service in respect of potato consignments destined for export free from wart disease (*Synchytrium endobioticum*) [*R.A.M.*, viii, pp. 56, 736] and showing a total not exceeding 4 per cent. of infection by blight (*Phytophthora infestans*), dry rot (*Fusarium*), common and powdery scab (*Actinomyces* [*scabies*] and *Spongospora subterranea*), bacterial (wet rot) and miscellaneous diseases.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements, January–March, 1935.—pp. 1–3, 1935.

Amendment No. 1 to the rules and regulations supplemental to Notice of Quarantine No. 38 (revised) provides that, as from 20th February, 1935, official permits are required for the inter-State movement between 13 protected States [which are listed] of any species of *Berberis* or *Mahonia*, apart from *B. thunbergii* or its horticultural varieties and rootless cuttings of *Mahonia* for decorative purposes only [*R.A.M.*, xiv, p. 63]. Such permits will not be issued in respect of species, varieties, or hybrids of *Berberis* or *Mahonia* sufficiently susceptible to black stem rust [*Puccinia graminis*] to involve risk of the spread of this disease.

Supplement No. 1 to the foregoing revision (4th March, 1935) adds *B. mentorensis* Ames (MS.), a new rust-resistant hybrid, to the list of species eligible for shipment under the usual restrictions into and between the protected States.

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW

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Cook (H. T.) & Callenbach (J. A.). **Spinach seed treatment.**—*Bull. Va Truck Exp. Sta.* 87, pp. 1213–1233, 2 figs., 1 graph, 1935.

After briefly referring to the considerable economic importance of damping-off (most of which is apparently caused by a species of *Pythium*) of spinach in south-east Virginia [cf. *R.A.M.*, xiii, p. 5], the authors give a tabulated account of greenhouse and field experiments in 1932 and 1934 to determine the relative value for seed treatment of red [cuprous] oxide of copper [ibid., xiv, p. 382], zinc oxide, zinc hydroxide, semesan, vasco 4 (a proprietary preparation manufactured by the Virginia Smelting Company containing zinc oxide and zinc hydroxide), and copper sulphate solution (1 lb. in 8 galls. water). In early autumn sowings all the treatments gave substantial increases in stands and yields, the best results being obtained with vasco 4 and zinc hydroxide. In later autumn sowings little or no benefit resulted from treatment with the zinc compounds, and copper sulphate always caused a reduction in stand. Red copper oxide caused no injury in the later sowing in 1932, when the weather was wet, but was injurious in 1934 when the late autumn was dry.

All the dusts (except semesan) were used at the standard rate of 2 per cent. of the seed by weight, and special tests indicated that increasing the dose of the dusts did not result in significant increase in yield of the crop. There was evidence that satisfactory results might be expected from red copper oxide and vasco 4 at the rate of 1·5 per cent. Of the various standard grades and brands of zinc oxide which were tested, Röhm and Haas AAZ Special was significantly superior to the other brands, and vasco 4 was better still.

Dusting the spinach seed with red copper oxide, vasco 4, or zinc oxide is recommended as the most practical, effective, and cheap treatment (costing under local conditions about 20 or 30 cents per acre) for early autumn sowings, but not for late autumn or spring plantings.

White (H. L.). **The sterilization of Lettuce seed.**—*Rep. exp. Res. Sta. Cheshunt, 1934*, pp. 41–45, 1935.

In further experiments at Cheshunt on lettuce seed sterilization [*R.A.M.*, xiii, p. 676] calcium hypochlorite (bleaching powder) was added to distilled water at the rate of 5 gm. per 70 c.c., the mixture being stirred, allowed to settle, decanted, and used immediately. Four

to eight hours is recommended as a suitable duration for the treatment, but any period between 15 minutes and 24 hours should give satisfactory results. Sterile samples were obtained in only 3 minutes, and after 15 minutes 90 per cent. of the treated seed was clean. Subsequent washing reduced the risk of injury. Germination remained unimpaired by any period of treatment under 24 hours.

CHAZE (J.) & SARAZIN (A.). **Le parasitisme du Champignon de couche par la môle est un phénomène réversible.** [The parasitism of the edible Mushroom by the 'môle' is a reversible phenomenon.]—*C.R. Acad. Sci., Paris*, cc, 21, pp. 1781–1783, 2 graphs, 1935.

An account is given of experiments in which transfers from the hymenial layer of the edible mushroom (*Psalliota*) [*campestris*] on carrot juice agar were found to inhibit the growth of the parasite, *Mycogone perniciosa*, in immediate contact with, or close proximity to, this portion of the host [*R.A.M.*, xiv, p. 490]. The invader even failed to grow on a medium which had been in contact with the hymenium of its host, the latter presumably containing diffusible antitoxins, the action of which is weakened in commercial beds, and absent or much reduced in tissues permitting infection.

COMTE. **Essais de bouillies cupriques au bicarbonate de soude dans la lutte contre le mildiou.** [Tests of cupric sprays with bicarbonate of soda for the control of mildew.]—*Progr. agric. vitic.*, ciii, 10, pp. 229–234, 3 figs., 1935.

The copper sulphate-bicarbonate of soda spraying mixture is prepared by adding powdered bicarbonate to a copper sulphate solution at the rates of 2·5 kg. to 3 kg. in 100 l. whereby carbon dioxide is freely generated by the action of the sulphate on the carbonate and this property is made use of to develop pressure in the spraying apparatus, two types of which (haversack and traction) are described. The apparatus consists essentially of a hermetically sealed body, in which the mixture of the two substances is effected after it is closed. In the traction sprayer the initial and final working pressures are stated to be 4 and 1·5 kg. [per sq. cm.], respectively. Field tests in 1935 indicated that the spray is as efficient as Bordeaux mixture and the copper hydroxide spray in the control of vine mildew [*Plasmopara viticola*], and is more wetting than either. The working of the new spraying apparatus also compared favourably with that of the ordinary sprayers, and effected an appreciable saving in manual labour.

DULAC (J.). **Étude des conditions de la meilleure efficacité d'une bouillie anticryptogamique au sulfure de cuivre.** [Study of the conditions assuring the highest efficacy of a fungicidal mixture with copper sulphide.]—*Progr. agric. vitic.*, ciii, 15, pp. 345–348, 1935.

The author discusses the advantages of using copper sulphide for the preparation of cupric sprays, especially for the control of vine mildew [*Plasmopara viticola*: *R.A.M.*, xiii, p. 714], and states that whereas alkaline or organic substances added to the spray reduce the solubility and the toxicity of the copper compounds formed from copper sulphide, the addition of copper sulphate and of a small quantity of

vanadium pentoxide was found to promote considerably the oxidation and the efficacy of the copper sulphide spray. The formula which gave the best results in 1934 in preliminary tests is copper sulphide paste 300 gm. (as copper), vanadium pentoxide 1 gm., copper sulphate 100 gm., water 100 l. Further work is still required, however, to determine the best conditions of preparation and application of the copper sulphide spray to avoid injury to the host plants. [This paper is reproduced in *Rev. Vitic., Paris,* lxxxii, 2128, pp. 230–232, 1935.]

DUPUY (A.). **Les travaux de sulfatage.** [Copper-spraying operations.]—*Progr. agric. vitic.*, ciii, 15, pp. 348–351; 17, pp. 394–399, 1935.

The author discusses various aspects of the work of spraying vines against mildew [*Plasmopara viticola*] and for increasing the usefulness of spraying apparatus, with the object of reducing spraying costs under the conditions prevailing in France.

RAVAZ (L.). **Chronique. Encore l'excoriose.** [Current events. Excoriosis again.]—*Progr. agric. vitic.*, ciii, 10, pp. 223–224, 2 figs., 1935.

The author states that excoriosis of the vine (*Phoma flaccida*) [*R.A.M.*, xiv, p. 346] has become in the current year exceptionally severe in certain French vineyards, this being attributed largely to negligence in applying control measures, which are briefly indicated.

VIALA (P.) & MARSAIS (P.). **Le court-noué.** [Court-noué.]—*Rev. Vitic., Paris,* lxxxi, 2092, pp. 69–73; 2093, pp. 85–90; 2096, pp. 133–139; 2099, pp. 181–187; 2101, pp. 213–218; 2102, pp. 229–235, 1934; lxxxii, 2118, pp. 69–72; 2127, pp. 217–223; 2129, pp. 248–251, 1 col. pl., 41 figs., 1935.

This is a detailed account of the authors' studies of the court-noué of the vine attributed by them to the activity of *Pumilus medullae* [*R.A.M.*, xiii, pp. 422, 680; xiv, p. 8], expanding somewhat the information already noticed in this *Review* from other sources.

LARUE (P.). **La maladie de la moelle en Autriche.** [The pith disease in Austria.]—*Progr. agric. vitic.*, ciii, 10, pp. 238–240, 1935.

This is a brief abstract from a recent preliminary paper by F. Zweigelt and F. Voboril (Die Markkrankheit in Oesterreich. [The pith disease in Austria.]—*Das Weinland, 1934*, 10, 6 pp., 6 figs.) on a disease of vine branches, which appears to be contagious and to spread so as to form groups of diseased vines. The disease affects old European stocks, grafted vines, and American direct producers, causing external symptoms very like those of court-noué attributed by Viala and Marsais to *Pumilus medullae* [see preceding abstract]. Longitudinal cracks in the cortex, extending sometimes even to the pith, are characteristic of the disease, and a symptom not described by French authors is that the current year's shoots lignify poorly, especially at the nodes, rendering the extremity of the vine branch movable, as if articulated. The pith of older shoots turns brown, then black, and finally disintegrates into a powder, and the nodal diaphragms are destroyed. The affected pith contains mycelial strands which pass from the pith cells through the medullary rays into the wood and the cortex, the tissues of which are

also disorganized. Attempts to control the disease by replacing diseased stocks by healthy ones have so far given negative results.

HÉDIN (L.). **Observations sur les broussins de la Vigne.** [Observations on Vine excrescences.]—*C.R. Acad. Sci., Paris*, cc, 15, pp. 1351–1353, 1935.

The protuberant excrescences known as 'broussins' [which are often beautifully veined and used for veneer] on the roots, collar, and limbs of vines in France [see next abstract] were found on chemical analysis to contain an excess of potassium and to be markedly deficient, on the other hand, in phosphorus, magnesium, and calcium. The particular kind of gall under observation does not appear to be reproducible by inoculation with *Bacterium tumefaciens*. [This paper also appears in *Rev. Vitic., Paris*, lxxxii, 2132, pp. 299–302, 1935.]

RIVES (L.). **Contribution à l'étude du broussin de la Vigne.** [Contribution to the study of Vine 'broussin'.]—*Rev. Vitic., Paris*, lxxxii, 2127, pp. 213–216; 2129, pp. 245–247, 4 figs., 1935.

The vine tumours termed 'broussin' in France [see preceding abstract] and 'schwarzer Brenner' in Germany are stated to be strongly reminiscent of crown gall [*Bacterium tumefaciens*] and usually to develop after frost injury in the early spring at the base of the stocks and, more rarely, of branches. As a result of his investigations, the author suggests that their origin is due to an abnormal proliferation of the cambium caused by the presence of oxidases which normally migrate to the developing buds and shoots in the spring but return after the death of the young shoots from frost. Although in nature various micro-organisms are abundantly associated with such tumours, none of those isolated by him was able to reproduce the condition on vines of various ages of growth, or to cause crown gall on pelargoniums.

BEAUMONT (A.) & STANILAND (L. N.). **Eleventh Annual Report of the Department of Plant Pathology, Seale-Hayne Agricultural College, Newton Abbot, Devon, for the year ending September 30th, 1934.**—59 pp., 2 figs., 1935.

Only one fungus disease has been found commonly attacking *Anemone coronaria* in Devon and Cornwall, namely, the anemone and plum rust, *Puccinia pruni-spinosae* [*R.A.M.*, xiii, p. 313]. A much more serious trouble is the so-called 'rust' or 'winter browning' of anemones, first observed by the writers in 1926 but of little importance until 1932, when it began to spread and assume a serious form all over Cornwall and North Devon. Diseased roots are brown and decayed, while the leaves show either a general purplish tint or brown rot of the margin, the latter sometimes extending later; rapid rotting of the petioles is also frequent. The flower crop is heavily reduced, the flowers already formed being small and brown-edged, with the result that large brown patches appear in the field. The disease may be a form of root rot, but so far no single fungus has been found to predominate in the affected material. Possibly an excess or deficiency of soil nutrients may be involved in its etiology.

The incidence of potato blight (*Phytophthora infestans*) was again carefully studied in relation to weather conditions [ibid., xiii, p. 561;

xiv, p. 190]. Four periods (two each in August and September) of high relative humidity (not less than 75 per cent. at 3 p.m.) were closely followed by outbreaks of the disease, which in general may be suspected on the basis of this factor alone.

Notes are given on the fungal diseases of cereals, potatoes, root crops, beans, vegetables (including tomatoes), fruit, flowers, and ornamentals observed during the year, and a complete list of crop diseases occurring in Devon and Cornwall is appended.

The Harper Adams Adviser. A review of advisory work in the West Midland Province 1934–1935.—*Adv. Rep. Harper Adams agric. Coll.* 10, 23 pp., 1935.

The following are among the phytopathological items occurring in this report. Grey speck of oats in Warwickshire was controlled by an application of manganese sulphate at the rate of 1 cwt. per acre, the yield being increased by 30 per cent. [*R.A.M.*, xiv, p. 575].

In a popular note on clover rot [*Sclerotinia trifoliorum*: see below, p. 685], N. C. Preston states that alsike [*Trifolium hybridum*] and the trefoils [*T.* spp.] are less susceptible to the disease than red clover [*T. pratense*], while the wild white [*T. repens*] appears to be completely immune.

Speyer (W.). **Tätigkeitsbericht der Biologischen Reichsanstalt für Land- und Forstwirtschaft, Zweigstelle Stade, für die Zeit vom 1 April 1934 bis 31 März 1935.** [Report on the work of the Stade Branch of the National Biological Institute for Agriculture and Forestry for the period from 1st April, 1934 to 31st March, 1935.] —Reprinted from *Altländer Ztg, Jork*, 60, 64, 68, 71, 4 pp., 1935.

The following are among the items of phytopathological interest in this report. Fruit trees in all parts of the Lower Elbe Valley are liable to infection by *Pholiota squarrosa* [*R.A.M.*, xii, p. 353] and *Agaricus melleus* [*Armillaria mellea*: ibid., xii, p. 739 *et passim*], one or other of which predominates according to the local climatic and soil conditions. Prevention of attack by these fungi is primarily important in any campaign for their control, which should include a study of the possible sources of inoculum, such as stakes and the like made from forest trees.

In spraying tests against apple scab (*Fusicladium*) [*Venturia inaequalis*] it was again found that Bordeaux mixture made with dolomitic lime [ibid., xii, p. 459] was more effective than that made with a white (marble) lime.

The cause of a destructive rot of horse-radish, which has been under investigation since 1933, is still obscure [cf. ibid., xiv, p. 419].

Hopkins (J. C. F.). **Annual Report of the Branch of Plant Pathology for the year ending 31st December, 1934.**—*Rhod. agric. J.*, xxxii, 6, pp. 397–405, 5 pl., 1935.

The first record of tobacco veinbanding [see below, pp. 685, 723] in Rhodesia was made in 1934, and was suspected to have spread from a neighbouring potato crop. Inoculations of healthy tobacco plants with filtered juice obtained from veinbanded ones gave 100 per cent.

ordinary mosaic. Towards the end of the season the principal causes of deterioration of the tobacco crop were frog eye [*Cercospora nicotianae*: *R.A.M.*, xiv, p. 200] (both the field and barn spot forms) and barn rot (*Rhizopus stolonifer*) [ibid., vii, p. 339]. An outbreak of leaf curl [ibid., xiv, p. 533] in the Shamva district caused heavy losses in spite of the removal of the source of infection (ratoon plants on an abandoned farm) and the replanting of the affected lands, these measures, however, serving greatly to ameliorate the situation. A new type of barn spot was due to *Aspergillus flavus*. An epidemic of rust [*Puccinia* spp.] is estimated to have reduced the wheat crop of the entire colony by one half.

Foot rot (*Phytophthora parasitica*) of garden flowers, particularly *Godetia*, *Clarkia*, *Antirrhinum*, and *Delphinium* spp., was satisfactorily controlled by working a small quantity of ready-made Bordeaux mixture in powder form into the soil round each plant.

New records made in 1934 (other than those already mentioned) include rose anthracnose (*Sphaceloma rosarum*), groundnut pod rot (*R. nigricans*), orange stem-end rot (*Diaporthe citri*) [see below, p. 693] and brown rot (*P. citrophthora*), and tobacco storage mould (*Aspergillus sulphureus*).

WALLACE (G. B.). **Report of the Mycologist, 1934.**—*Rep. Dep. Agric. Tanganyika*, 1934, pp. 90–93, 1935.

In this report [cf. *R.A.M.*, xiii, p. 746] it is stated that the number of rain-forest and savannah trees in Tanganyika which become heavily infected by root disease (*Armillaria* sp.) [ibid., xiii, p. 114] after the aerial parts have been felled seems to be practically limitless, though camphor (*Ocotea usambarensis*) appears to be unaffected. Living trees of *Trema guineensis* are very susceptible, sheets of mycelium having been observed under the bark ten feet from the ground; an additional 23 living hosts (including *T. guineensis*) of *Armillaria* are recorded for Tanganyika, making a total of 54. The fungus has not been observed at elevations of under 3,000 feet.

The disease of coffee, tea, and other plants previously reported as due to a species of (?) *Stilbum* [ibid., xiv, pp. 13, 184] was found in two localities 6,000 ft. or more above sea level and characterized by very cold weather during the rainy season. The fungus multiplies and is destructive only during the cold, wet season; it is most abundant where dampness is favoured by enclosed conditions and where crops are sheltered by *Grevillea robusta* and eucalyptus, which are very susceptible. It was observed on 15 economic species of plants and one indigenous tree, *Bersama* sp.

A preliminary field test indicated that stem rot of sisal [*Agave rigida* var. *sisalana*: ibid., xii, p. 201] is reduced by the application of artificial fertilizers. From infected material a fungus was isolated which caused a localized rot on injured leaves kept in a moist atmosphere, confirming the view based on field observation that an organism enters the sisal while it is being cut during the rains.

Septoria nodorum [ibid., xiii, p. 177] was destructive to wheat in Dahaga.

At Morogoro avocado seedlings and young trees 10 ft. high suffered

severely from a disease, apparently of bacterial origin, characterized by the presence of cankers (sometimes along the whole length of the stem and branches) starting as small, water-soaked, raised, grey-brown blisters, which burst, liberating a red gum.

Concentric ring blotch of citrus [ibid., ix, p. 450] was recorded at Usanga, in the Iringa Province, and *Plasmopara viticola* on vines at Ruvu.

MARCHAL (É.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1934.** [Observations and researches carried out at the State Phytopathological Station during the year 1934.]—*Bull. Inst. agron. Gembloux*, iv, 2, pp. 97–105, 1935. [Flemish, German, and English summaries.]

The following items of phytopathological interest are contained in this report, which is on the same lines as those of previous years [*R.A.M.*, xiii, p. 492]. *Gibberella saubinetii* and *Ophiobolus graminis* were observed on wheat grown after oats. Rye near Bruges suffered important losses from a wilting of the young plants due to infection by *Typhula graminum* [ibid., xii, pp. 367, 615, 684; xiv, p. 93], a fungus only once before recorded in Belgium, from the vicinity of Namur.

Potatoes, especially in the Ardennes, were widely attacked by *Alternaria solani*, which seriously damaged the foliage and occasionally caused marked reduction of yield. Pear trees, especially those of the Légipont variety near Herve showed black, necrotic, depressions in the bark due to *Diaporthe parasitica* Marchal. Plum leaves from Brussels were observed to be covered with large, zonate brown spots caused by *Cladosporium condylonema*, the first record of this fungus in Belgium.

Tobacco plantations in the Stanleyville region of the Belgian Congo are stated to have been very severely attacked by a disease closely resembling 'kroepoek' [leaf curl: ibid., xii, p. 791; xiii, p. 806].

PETRI (L.). **Rassegna dei casi fitopatologici osservati nel 1934.** [Review of phytopathological records noted in 1934.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 1, pp. 1–95, 4 figs., 1935.

During the period under review [cf. *R.A.M.*, xiii, p. 562] vine leaf roll [ibid., xiii, p. 353] was present in many localities, frequently developing after several years' healthy growth. Near Palermo cases of progressively increasing infection 12 to 15 years after planting have been observed on previously very vigorous Rupestris vines. The only resistant varieties in these cases were Riparia and Berlandieri, planted in 1894; in 1932, however, the latter suddenly became attacked. In several districts during 1934 the Negro amaro variety showed very pronounced leaf roll; the double grafting of Malvasia bianca on this variety caused the external symptoms to disappear, possibly owing to masking. Vines affected with mycoses of the trunk and branches did not show the presence of *Pumilus medullae* [see above, p. 675].

Notes are given on other vine diseases that may be confused with leaf roll, and attention is directed to the need for correct diagnosis, reference being made to Catoni's method of detecting the endocellular cordons [ibid., xiii, p. 214] under field conditions by cutting a basal

internode transversely, when they can be seen with a low power field microscope (×30 to 50) across the lumen of the vessels.

Non-parasitic 'anthracnose ponctuée' [ibid., vi, p. 459] affected the internodes, especially the basal ones, of vines near Rome. The condition is attributed by Moltz to the death and subsequent discoloration of the stomatal cells and the tissue bordering the stomatal chamber.

A wilt closely resembling Californian dry rot was general throughout the olive-growing districts of Italy [ibid., xii, p. 745]; the cause has not yet been ascertained.

Sibilia found that yellowish and brownish discolorations of the lower and upper surfaces respectively of apple leaves were caused by fumes from a factory, most of the injurious effects being due to sulphur pentoxide and nitrous vapours.

Peach roots, especially those of young trees, were widely attacked by *Pseudomonas* [*Bacterium*] *tumefaciens* [ibid., x, p. 40]. A gnawed appearance of the tegument of shelled almonds was attributed to infection by *Gloeosporium amygdalinum* [ibid., xii, p. 380], followed by a Basidiomycete. Almond roots were also attacked by *Bact. tumefaciens*.

Corylus avellana was rather severely infected by *Labrella coryli* (Desm. & Rob.) Sacc., and *Phyllactinia suffulta* [*P. corylea*: ibid., xiii, p. 308].

Attempts to find lemon varieties resistant to 'mal secco' [*Deuterophoma tracheiphila*: ibid., x, p. 593; xiii, p. 474] were extended to Indian and other Asiatic varieties; two Sicilian lemons, Interdonata and Monachella, are appreciably resistant.

Oranges in Catania have for some years been severely attacked by a root rot associated with a *Phytophthora* which in culture formed non-papillate zoosporangia, 50 to 55 by 29 to 32 μ (in very favourable conditions, 59 to 60 by 42 to 43·5 μ); it grew well at 30° to 32° C. Two species of *Pythium* were also isolated from the infected roots, one of the *de Baryanum* type and the other (probably *P. megalacanthum*) [ibid., xii, p. 372] with a spiny oogonium, which measured (including the 4 to 5 μ long spines) 33 to 35 μ in diameter, the oospore being 18 to 19 μ.

Phytophthora cambivora was isolated from the cambium of the roots of walnuts showing symptoms resembling those of chestnut ink disease due to the same fungus [ibid., xiii, p. 336]. The ink disease-resistant Japanese chestnuts (*Castanea crenata*) [ibid., xiii, p. 63] planted in Piedmont to test their suitability under Italian conditions have not given very encouraging results, those growing in Cuneo, for example, suffering from the cold; a number of them die off every year.

Quercus ilex trees at Rome showed severe infection by the uredo stage of *Cronartium quercuum* [ibid., xii, p. 396]; spraying with 1·5 per cent. Bordeaux mixture gave excellent control.

Nursery seedlings of *Cedrus* [*libani* var.] *deodara* at Funo wilted rapidly as a result of root rot due to *Fusarium fuliginosporum* [ibid., vi, p. 7].

A serious wilt of *Acacia farnesiana* affecting isolated trees was associated with a mycelium in the rotting roots which in culture formed a carbonaceous-black layer with greenish-grey aerial hyphae and black, aggregated, papillate, plurilocular pycnidia of a *Dothiorella*; the ellipsoidal, hyaline, pycnospores measured 3·5 to 4 by 2·2 to 2·5 μ.

Beans (*Vicia faba*) from Sulmona showed the leaf spot due to *Cercospora zonata* and others from Agrigento that due to *C. fabae* [ibid., xiii, p. 670].

Fennel (*Foeniculum*) [*vulgare*] plants were affected by a bacteriosis (? *Bacillus carotovorus*) of the aerial parts and roots around Rome and on the Adriatic coast; the disease causes extremely heavy losses and is still spreading. The necrotic areas on the tap root involved all the cortical parenchyma and the medullary rays, and extended up to the leaf stalks and the veins of the outside leaves.

Tomatoes with fern-leaf symptoms also showed typical mosaic [ibid., xiii, p. 808]. Tomato fruits from Agrigento showed a spotting similar to that caused by *Bact. vesicatorium* [ibid., xii, p. 555]; a bacterium was present in the epidermal tissues and underlying cells.

Geraniums (*Pelargonium* sp.) near Rome were infected by *Macrosporium pelargonii* [ibid., x, p. 461], and zinnias at Orvieto by *Bact. solanacearum*.

Summary report of progress from July 1, 1932 to June 30, 1934.—*Bull. Utah agric. Exp. Sta.* 250, 66 pp., 1934. [Received September, 1935.]

The following are some of the references of phytopathological interest occurring in this report. A winter wheat variety, Relief, originating from a cross between Turkey and Hussar and resistant to both types of bunt (*Tilletia tritici* [*T. caries*] and *T. foetens*) found in the State [*R.A.M.*, xii, p. 424] is available for distribution to farmers. Early autumn sowing, where natural soil infection occurred, was found to favour bunt attacks, which did not occur, on the other hand, in spring sowings, indicating that overwintering of the fungi in the soil plays little part in the etiology of the disease. Eight distinct physiologic forms of *T. caries* and *T. foetens* have been isolated from local collections by the use of differential wheat varieties [cf. ibid., xiv, p. 287].

Potato crinkle mosaic [ibid., xiv, p. 524] symptoms have been produced on *Datura* sp. and tobacco, and observations on a number of other Solanaceous plants and common weeds indicate the wide distribution of the disorder.

Bacterial canker of tomatoes [*Aplanobacter michiganense*: ibid., xiv, p. 535] is stated to have cost local growers about $30,000 in 1933. The seed was experimentally proved to be the chief source of primary infection, followed by seed-bed, and then by field soil, infections. From 40 to 60 per cent. of the plants raised from diseased seed developed canker, as against about 34 per cent. of those from healthy seed in an infected cold-frame soil, and only 1·3 per cent. of the stand from sound seed in diseased field soil, from which the causal organism may be adequately eliminated by a triennial crop rotation. Wounded roots appear to be highly favourable infection courts. Under western conditions systemic infection develops only to a limited extent from invasion through such natural channels, incubation periods of 4 to 90 days having been observed. The spread of *A. michiganense* is promoted by low temperatures during germination and seedling development and by medium ones during the growing season. The organism is stated to

be completely eradicable from infected material intended for seed production by fermenting the pulped fruit for 72 to 96 hours prior to seed-extraction; various procedures are on trial with a view to combining effective seed-borne canker control with the best possible use of the juice for canning purposes. Two wild tomatoes and *Lycopersicum pimpinellifolium* appear to be highly resistant to *A. michiganense*, whereas all the dwarf varieties used in the trials showed a high degree of susceptibility.

A rapid extension of bacterial wilt of lucerne [*A. insidiosum*: ibid., xiv, p. 638] has been observed in eight counties; in the Cache Valley the disease may be so destructive as to preclude the possibility of a fourth year's harvest.

Among the fungi isolated from strawberry plants affected by a widespread and virulent root rot were three strains each of *Rhizoctonia* [ibid., xiv, p. 562] and *Fusarium*, two of *Phytophthora* [ibid., xiv, p. 180], and one each of *Mucor* and *Aspergillus*. Conspicuous features of the disease include marginal reddening of the leaves, purpling of the veins, general stunting, shrivelling of the fruit, and destruction of the roots.

MANNS (T. F.), MANNS (M. M.), & ADAMS (J. F.). **Department of Plant Pathology.**—*Rep. Del. agric. Exp. Sta. 1933–4* (*Bull.* 192), pp. 40–49, 1 pl., 1935.

The following are among the items of interest in this report [cf. *R.A.M.*, xiii, p. 563].

The myrobalan plum (*Prunus myrobalan*), which is used as budding stock for many American plum varieties, may carry yellows and little peach [see below, p. 704] without showing any very marked symptoms. Evidence was obtained that other plum varieties may show signs of these diseases but live for many years, while heavily infested with the insect vector *Macropsis trimaculata*. One Red June Japanese plum (*P. salicina*), 22 years old, carried over 10,000 of these insects, and was proved by budding to carry the yellows virus. The wild plum variety *P. munsoniana*, also breeds the insect abundantly and carries the yellows virus. *M. trimaculata* was the only insect found breeding throughout the peach-growing area of Delaware on unsprayed plums. In the Ohio Experiment Station plum orchard, Wooster, with trees about 9 years old, which was well sprayed, no plum leafhoppers were found, but thousands were collected from the sprayed plum orchard at Delaware Experiment Station (trees about 27 years old). Peach seedlings were readily infected with both yellows and little peach by plum leafhoppers, while three out of ten 19-year-old peach trees similarly treated showed foliage symptoms resembling those of little peach.

In comparative spraying tests with zinc sulphate alone and in combination with three sulphur sprays and a colloidal sulphur spray for the control of bacterial spot [*Bacterium pruni*: ibid., xiii, p. 564] of peach the best results were given by dry-mix 20 lb., zinc sulphate 10 lb., and hydrated lime 10 lb. (20 lb. when using lead arsenate 1 in 50 for the 'shuck' and 'first cover' applications) per 250 galls. of spray and by sulfospray (3 qts. per 250 galls.), the percentage infection for

these treatments being, respectively, 3·2 and 3·6 per cent. In another test, in which a mixture of zinc sulphate and hydrated lime, each 30 lb. per 300 galls. of spray, was compared with koloform 30 lb. at petal fall, shuck, and first cover, followed by flotation sulphur 30 lb. at second cover (both per 300 galls.), the former treatment gave 4·7 and the latter 10 per cent. infection, the corresponding figures for scab [*Cladosporium carpophilum*: loc. cit.], however, being 14 and 5·4 per cent.

Of a number of sulphur and copper fungicides tested against apple scab [*Venturia inaequalis*] the best results were obtained with dritomic [ibid., xi, p. 385], kolofog [ibid., xiii, p. 528, and below, p. 693], and coposil [ibid., xiv, p. 150], which on the Grimes variety gave 0·7, 3·8, and 2·6 and on Jonathan, 1·4, 2·7, and 0·7 per cent. infection, respectively.

Forty-fifth Annual Report of the Alabama Agricultural Experiment Station for the fiscal year ending June 30, 1934.—30 pp., 1 fig., [? 1934. Received August, 1935].

The following items of phytopathological interest occur in this report. *Mycosphaerella* [*pinodes*] was found by J. L. Seal to be the most prevalent disease of winter peas and vetches [*Vicia* spp.: *R.A.M.*, xiv, p. 614], though species of *Ascochyta* were also responsible for some damage. The pycnospores of the fungi formed during the summer and autumn of 1933 retained a high percentage of viability until late November, when young plants were readily infected by covering them with old diseased material. The organisms remained almost inactive throughout the early part of the winter, but after the February and March frosts they developed profusely on practically every plant in the stand. Vetches appear to be generally more resistant to the fungi under observation than peas, Hungarian and certain Oregon vetch strains being specially promising as cover crops.

O. C. Medlock's storage experiments with Stuart and Frotscher pecans [*Carya pecan*] showed kernel moulding to be the most serious problem. A temperature below 40° F. was apparently necessary to keep the nuts in marketable condition for a year.

Osmun (A. V.). **Department of Botany.**—*Rep. Mass. agric. Exp. Sta., 1934*, pp. 23–27, 1935.

The following items of phytopathological interest occur in this report, to which W. L. Doran and E. F. Guba contribute. Slight foliage injury to greenhouse cucumbers was caused by spraying with a resin solution (1 in 135) [*R.A.M.*, xii, p. 493] four times at weekly intervals against *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* [ibid., xiii, pp. 418, 496]; the solution gave less control than Bordeaux mixture (3–3–50). Weather conditions in August appear to have less effect on the disease than those in July, early outbreaks being associated with heavy rain in the latter month.

Infection of lettuces by *Bremia lactucae* [ibid., xiii, p. 496] was equally well prevented by Bordeaux mixture 4–4–50, 2–2–50, and 1–1–50, applied six times at weekly intervals; at the strongest of these

concentrations the mixture significantly retarded growth. The following lettuce strains were markedly resistant to infection: Blonde Pionnel (Clause), Merveille d'Hiver (Clause), Batavia Beau Jolaise (Clause), Batavia White Paris (Bulleri), and May Wonder (Benary).

Evidence was obtained confirming the view that eggplant wilt (*Verticillium albo-atrum*) [ibid., xii, p. 494] may be seed-borne, seed from plants showing the characteristic brownish discoloration of the fibro-vascular bundles in the distal half of the fruit being infected. Hot water treatment at 117·5° F. for 30 minutes killed the fungus without apparently injuring the seed.

Bewley tomato hybrids crossed with Norduke showed partial resistance to leaf mould (*Cladosporium fulvum*) [ibid., xiii, pp. 496, 685]. Only limited resistance can be expected as a result of hybridizing varieties within the species *Lycopersicum esculentum*, but the hybrids obtained by crossing the immune variety *L. pimpinellifolium* [ibid., xiv, p. 202] with three varieties of *L. esculentum* showed in the F_2 a heterozygous condition for all characters, and immunity appeared in the ratio of 3:1. Selections from immune individuals are being grown in the F_3 generation to establish resistant lines and to back-cross with the parent varieties of *L. esculentum*, i.e., Belmont, Break o' Day, and Success, for desirable fruit size.

Efforts to find a suitable means of disinfecting stored squashes [*Cucurbita* sp.] showed that burning sulphur at the rate of 5 lb. per 10,000 cu. ft. of storage gave excellent disinfection but injured the fruit. Further work with sulphur dioxide is in progress. Formaldehyde gas generated from 9 oz. of 40 per cent. formaldehyde solution with 6 oz. of potassium permanganate and used in 1,500 cu. ft. of storage space for 12- to 24-hour periods (any number of treatments up to this total of hours) was effective for all practical purposes. The optimum temperature for the growth of the organisms responsible for storage decay of squashes (among which *Bacillus tracheiphilus* [ibid., xiii, p. 212] caused more damage than all the others combined) was approximately 78° F., though in a few cases it ranged between 75° and 85°; the maximum ranged from 92° to 97°, while the minimum was generally 40°, exceptionally 33° to 35°. Infection chiefly occurs at the stem end, but is also found at the blossom end.

One-and-a-half acres were planted to yellows-free and otherwise healthy Howard 17 strawberries [ibid., xiii, p. 41] for plant production; in 1935 over 100,000 plants will be distributed to local growers.

New carnation varieties resistant to *Alternaria dianthi* [ibid., xiii, p. 497] included Orchid Beauty, Bonanza, Mrs. M. Beverlein, Joy, Chief Kokomo, and Mary E. Sim.

Post-germination damping-off [ibid., xiv, p. 382] of herbaceous ornamental plants was well controlled by soil treatment with ammonium hydroxide 1 in 30 to 1 in 50, calcium cyanamide 12 to 16 gm. per sq. ft. of soil (3 in. deep) and by raw pyroligneous acid [ibid., xi, p. 589] 4 in 100, both liquids being applied at the rate of 2 qt. per sq. ft.

Sulphur fungicides reduced rust (*Gymnosporangium juniperi-virginianae*) on Wealthy apples [ibid., xiv, p. 368] to some extent, but even the best of five materials tested, viz., liquid lime-sulphur and Linco colloidal paste, reduced infection by only 50 per cent.

Forty-seventh Annual Report of the Kentucky Agricultural Experiment Station for the year 1934. Part I.—67 pp., 1935.

The following items of phytopathological interest occur in this report. Etch and cucumber mosaic of tobacco [*R.A.M.*, xii, p. 205] were unusually prevalent in 1934. Infection of the same host with the vein-banding virus [ibid., xiv, pp. 605, 677] declined from 86 per cent. among plants in close proximity to Irish Cobbler potatoes to 2 per cent. in the rows at a distance from the latter. The soil carry-over of mosaic was again investigated in plots showing in the previous year no mosaic, 100 per cent. yellow, and 100 per cent. green mosaic [ibid., xiv, p. 85], but no evidence was obtained of infection from the soil in the new crop up to blooming time. Where cut-up yellow mosaic stalks were 'disked in' just before setting, 3 per cent. yellow mosaic developed during the summer, the corresponding figure for green mosaic being slightly over 6 per cent.; 1 per cent. green mosaic also occurred where no stalks were disked in.

Most of the 30 strains of tobacco mosaic inoculated into a resistant tobacco collected by Nolla in Colombia [cf. ibid., xiv, p. 401] produced no visible effect, but several caused the development of a necrotic spot or ring near the point of entrance which failed to become systemic. All the strains producing no external symptoms assumed a systemic form, but the virus did not enter the growing point.

A very promising new variety of White Burley tobacco, Kentucky No. 16, resistant to root rot [*Thielaviopsis basicola*: ibid., xiii, p. 13] has been developed by hybridization.

A further comparative study of the agent of crown rot of clover producing spring apothecia with *Sclerotinia trifoliorum* [ibid., xiii, p. 240, and above, p. 677] has shown that the two organisms are distinct, the former corresponding closely in ascospore dimensions and cultural growth rate with *S. sclerotiorum* [ibid., xiv, pp. 39, 315].

Raspberries sprayed with Bordeaux mixture in 1933 retained their foliage much better than unsprayed plants, on which the leaves were destroyed by *Septoria* [*Mycosphaerella rubi*: ibid., xiii, p. 174]. Some 85 per cent. of the untreated Latham canes died back during the winter, compared with only 25 per cent. of the sprayed. In 1934 the fungus did not develop until about midsummer, after which unsprayed canes were defoliated. The Chief variety appears to be rather more susceptible than Latham to *M. rubi* and the subsequent winter injury.

Bouriquet (G.). **Madagascar: phytopathological notes.**—*Int. Bull. Pl. Prot.*, ix, 6, pp. 125–128, 1935.

Free copper treatment of some 100,000 Arabian coffee trees against *Hemileia vastatrix* [*R.A.M.*, xiii, p. 505] is stated to have been carried out by the Itasy (Madagascar) local administrative authorities for propaganda purposes.

Helminthosporium turcicum, the agent of a highly destructive maize disease [ibid., xiv, p. 431], affecting especially late varieties such as Plata, was first recognized in the colony early in 1934.

Tobacco in the Miandrivazo district is liable to the same diseases as

on the high tablelands, including crinkle [leaf curl: ibid., xi, p. 478; xii, p. 58] and 'kroepoek' [see above, p. 679].

PINCKARD (J. A.). **Physiological studies of several pathogenic bacteria that induce cell stimulation in plants.**—*J. agric. Res.*, l, 12, pp. 933–952, 1 diag., 3 graphs, 1935.

In an attempt to throw some light on the nature of the stimuli responsible for atypical and pathological proliferation of living cells the author made comparative physiological studies of the crown gall organism *Phytomonas* [*Bacterium*] *tumefaciens*, the causal agent of bacterial pocket rot (considered to be a modified gall) of sugar beet (*P.* [*Bact.*] *beticola*) [*R.A.M.*, x, 424], the olive knot organism (*P.* [*Pseudomonas*] *savastanoi*) [ibid., xiii, p. 551], and the oleander tubercle organism (*Phytomonas* [*P.*] *savastanoi* var. *nerii*) [ibid., xiii, p. 748]. The results [which are shown in tabular and graphical form] indicated that while *Bact. tumefaciens* was pathogenic to all the hosts used, *P. savastanoi* var. *nerii* was pathogenic to oleander and olive, and the beet rot and olive knot organisms were each only able to attack their original hosts. On the common bacteriological culture media used the different bacteria gave growth reactions distinctive for each, with the exception that the olive knot and oleander organisms showed similar cultural characters. The optimum temperature for growth on agar was about 28° C. for all the bacteria except *Bact. beticola*, which formed the largest colonies at about 32°. The hydrogen-ion concentration at which growth was inhibited in liquid media was found to vary from P_H 3·6 to 4·4 in the acid, and from 9·5 to 10·5 in the alkaline, range. Comparative studies of the utilization by these organisms of compounds containing nitrogen and carbon showed that the inability of certain of them to utilize several of the compounds was not due to unfavourable oxidation-reduction intensities of these media at hydrogen-ion concentrations approaching neutrality. It was further shown that all the organisms produced relatively strong reducing potentials in undisturbed liquid cultures, this being in opposition to the oxidizing action of acid metabolic products.

MATSUMOTO (T.) & OKABE (N.). **Bacteriophage in relation to Bacterium solanacearum. I. Temperature relation, specificity, and serological reaction.**—*J. Soc. trop. Agric.*, vii, pp. 130–139, 1 pl., 1935.

A brief description is given of the technique used in obtaining the bacteriophage from *Bacterium solanacearum* in diseased tomato tissues in Formosa, Japan [cf. *R.A.M.*, xiii, p. 152]. Inactivation of the lytic principle was effected by five minutes' exposure at 64° C., the corresponding periods at 65°, 62°, 61°, and 60° being 3 to 4, 13 to 16, 18 to 25, and 80 minutes, respectively. The multiplication of the bacteriophage was most profuse in the series of tubes incubated at 34°, the approximate optimum for the growth of *Bact. solanacearum*. None of the thirteen species of bacteria [which are listed] exposed to the action of the bacteriophage of *Bact. solanacearum* proved susceptible to its influence. The injection of the bacteriophage into rabbits was followed by the production of neutralizing, but not of specific precipitating or agglutinating, antibodies.

Anvisningar rörande utsädesbetning. [Directions for seed-grain disinfection.]—*Flygbl. Växtskyddsanst., Stockh.* 13, 7 pp., 4 figs., 1934. [Received August, 1935.]

This pamphlet, a revised edition of No. 2 in the same series, gives directions in popular terms for the treatment of cereal seed-grain in Sweden against some well-known fungous diseases [*R.A.M.*, xiii, p. 87].

MELANDER (L. W.). **Effect of temperature and light on development of the uredial stage of Puccinia graminis.**—*J. agric. Res.*, l, 11, pp. 861–880, 3 figs., 2 graphs, 1935.

The results of the laboratory experiments reported in some detail in this paper showed that uredospores of *Puccinia graminis tritici*, *P. g. avenae*, *P. g. secalis*, and *P. g. phlei-pratensis* that had been hardened to cold by exposure for ten days or longer to a temperature of 0° C. were more resistant to much lower temperatures (—29° to —40°) than those that had not been so hardened; in a dry condition the treated uredospores of *P. g. tritici* and *P. g. phlei-pratensis* survived at least 45 days, and those of *P. g. avenae* 40 days' constant exposure to these temperatures. In the non-hardened series a few uredospores of *P. g. tritici*, *P. g. phlei-pratensis*, and *P. g. avenae* remained viable for 45, 35, and 15 days respectively, at these low temperatures. Daily alternations of temperatures above and below 0° C. had no greater killing effect on the non-hardened uredospores of physiologic form 15 of *P. g. tritici* than constant freezing, but killed more hardened spores after nine days than the latter. Low temperatures lengthened the incubation period of the rust, about a week longer being required for the formation of uredosori on plants kept at 10° than at 20°, and much longer on plants kept at 0° to 1°; at this temperature *P. g. tritici* form 35 formed uredosori in about 70 days, but form 15 did not produce them in 80 days on plants that were placed at this temperature 48 hours after inoculation [cf. *R.A.M.*, xiv, p. 500].

The investigation further showed that the mycelium of at least some physiologic forms of *P. graminis* (e.g., *P. g. tritici* form 35 and *P. g. secalis* form 7) can withstand as low temperatures as the host can. Physiologic forms of *P. g. tritici* and *P. g. avenae* differed in their ability to produce uredosori at low temperatures; thus, *P. g. tritici* form 36 at 0° to 1° produced normal uredosori readily, while forms 15 and 35 only formed a few minute pustules, and *P. g. avenae* form 2 did not produce uredosori as readily as form 5. *P. g. secalis* form 7 formed normal uredosori at this temperature. A temperature of 0° to 1° stimulated the production of the teleuto stage.

Light intensity did not appear to have a significant effect on the type of infection produced, but low intensities delayed the formation of uredosori. On the other hand, the intensity and quality of light seemed to affect the size and shape of the uredospores. In *P. g. tritici* form 15 the spores produced under a light intensity of 301 foot-candles at 20° C. were significantly longer than those produced under other light conditions, and uredospores produced in artificial light were significantly longer and narrower than those produced in the greenhouse.

Tavčar (A.). **Lodicules et culture de Froment résistant au charbon.** [Lodicules and Wheat breeding for loose smut resistance.]—ex 16me Congrès int. Agric., Budapest, 1934. Rapp. spéc. Budapest: Min. Agric., Sect. 4, Thème 2, pp. 1–9 [1934. Abs. in *Exp. Sta. Rec.*, lxxiii, 2, pp. 193–194, 1935.]

That the Prolific winter wheat variety showed about seven times as much natural infection by loose smut (*Ustilago tritici*) in Jugo-Slavia as did the du Banat variety, in spite of the fact that artificial inoculations revealed no difference in average susceptibility between the varieties, was probably due to the larger size of the lodicules in Prolific, in which variety the glumes, on an average, opened 9·58° wider and remained open 3 minutes longer than was the case with du Banat. It is, therefore, concluded that lodicule size is of importance in the development of wheat varieties resistant to *U. tritici*.

Machacek (J. E.) & Greaney (F. J.). **Studies on the control of root-rot diseases of cereals caused by Fusarium culmorum (W. G. Sm.) Sacc. and Helminthosporium sativum P., K., and B. III. Effect of seed treatment on the control of root rot and on the yield of Wheat.**—*Sci. Agric.*, xv, 9, pp. 607–620, 1935. [French summary.]

The results of laboratory, greenhouse, and field experiments [details of which are given] from 1932 to 1934 showed that seed treatment with semesan and ceresan both in liquid and in dust form, and also new improved ceresan and uspulun in liquid form gave good control of the foot rot of wheat, oats, and barley, caused by *Fusarium culmorum* and *Helminthosporium sativum* in Canada [*R.A.M.*, xiv, p. 298]. All the liquid organic mercury compounds were used at the concentration of 5 per cent. Semesan was slightly superior to ceresan and new improved ceresan, and unlike them, caused little or no seed injury. Uspulun was the least effective. No practical control was given by copper carbonate either in dust form or in solution, or by nickel sulphide or iodine-infusorial earth (containing 5 per cent. iodine by weight) as dusts [cf. ibid., x, p. 119], while formaldehyde (1 in 320 commercial formalin solution) tended to increase the intensity of the disease, apparently by its retarding influence on the growth of the seedlings, and markedly decreased the yield.

The fact that all the organic mercury compounds significantly increased the yield of Marquis wheat in 1932 (by 8 bushels per acre in plots raised from ceresan-treated seed), but not in 1933 or 1934, which were unusually dry during the early part of the growing seasons, would suggest that the efficiency of seed treatment against foot rots depends to a certain extent on the amount of moisture in the soil at the time of, and subsequent to, sowing.

Brömmelhues (Maria). **Die wechselseitige Beeinflussung von Pilzen und die Bedeutung der Pilzkonkurrenz für das Ausmass der Schädigung an Weizen durch Ophiobolus graminis Sacc.** [The reciprocal influence of fungi and the significance of fungal competition in relation to the extent of injury to Wheat from *Ophiobolus graminis* Sacc.]—*Zbl. Bakt.*, Abt. 2, xcii, 4–7, pp. 81–116, 10 figs., 1935.

A series of experiments [which are fully described and the resulting

data tabulated] was carried out at the Bonn Agricultural College to determine the reciprocal effects of contact between cultures on biomalt agar and wheat extract solution of *Ophiobolus graminis*, *Cercosporella herpotrichoides*, *Fusarium culmorum*, *Helminthosporium sativum*, *Cladosporium herbarum*, *Alternaria* (?) *tenuis*, *Penicillium* sp., *Mucor* sp., and *Bacillus coli* [cf. *R.A.M.*, xii, pp. 109, 684; xiv, pp. 569, 570].

O. graminis was most effectively inhibited in culture on both solid and liquid media by *H. sativum* and *P.* sp., *A.* (?) *tenuis* being also actively antagonistic in the latter. Among the consequences of competitive suppression may be mentioned temporary or permanent cessation of growth, often at a considerable distance from the opposing mycelium, reduced vegetative development and reproductive capacity, and anomalies of pigmentation. Inhibition is apparently due, not alone or in the first place to the withdrawal of nutrient material, but rather to the secretion by the antagonistic organism of thermostable, readily diffusible substances.

It was shown by soil inoculation tests on Heines Kolben [Club] wheat seedlings in pots that *O. graminis* causes the most severe damage on plants previously exposed to four weeks' infection by most of the above-mentioned fungi, especially *C. herbarum* [ibid., xiii, p. 21], the virulent toxins produced by which evidently increase susceptibility to the first-named pathogen. On the other hand, plants grown in soil simultaneously inoculated with *O. graminis*, *H. sativum*, and *P.* sp. suffered less than those infected by the first-named alone, though the weakly antagonistic forms *A.* sp., *M.* sp., and especially *C. herbarum*, similarly applied, increased the injury caused by *O. graminis*.

These facts are considered largely to explain the widely observed virulence of *O. graminis* on light soils of poor adsorptive capacity [ibid., xiii, pp. 87, 758], in which the root-attacking toxins formed by its saprophytic concomitants can disperse without hindrance; hence the value under such conditions of an admixture of clay or activated charcoal.

EWERT (R.). **Pflanzenkrankheiten und Witterung. Starkes Auftreten von Mehltau, Roggenbraunrost und Fritfliege im Herbst 1934.** [Plant diseases and weather. Heavy incidence of mildew, brown rust of Rye, and frit fly in the autumn of 1934.]—*Mitt. Landw., Berl.*, l, 16, p. 337, 1935.

A number of plant diseases, such as brown rust of rye [*Puccinia secalina*: *R.A.M.*, xiv, p. 300] and barley and rye mildew [*Erysiphe graminis*: ibid., xiv, p. 433], are stated to have been favoured in the autumn of 1934 in the Grenzmark district of Germany by the heavy rains following an abnormally dry summer. Early sown rye (up to the middle of September) was most severely, but by no means exclusively, affected. This crop suffered most damage on light soils, the virulence of the rust being further intensified where rye followed rye as compared, for instance, with a serradella [*Ornithopus sativus*]-rye rotation.

No differences in varietal reaction to *E. graminis* were shown by Friedrichswerther Berg, Peragis, Mahndorf, Carstens Two-rowed, and other standard barleys. Here again early sowing promoted infection, but in order to secure adequate yields under local conditions the seed

must be in the ground by about 10th September. Rye was injured chiefly in densely planted stands.

DENNIS (R. W. G.). **Notes on the occurrence of Pyrenophora avenae Ito, in Scotland.**—*Trans. Brit. mycol. Soc.*, xix, 4, pp. 288–290, 9 figs., 1935.

After referring to his previous communication on *Helminthosporium avenae* in Scotland [*R.A.M.*, xiii, p. 365; xiv, p. 558], the author states that in January, 1934, a few King Oats stems collected in Ayrshire bore perithecia, only one of which contained mature ascospores. Single-spore cultures made from it gave rise to a tufted aerial mycelium typical of *H. avenae* which within a month freely produced conidia of the fungus. As the season advanced rudimentary perithecia became more abundant on the stubble, but the proportion of them containing mature asci remained extremely low as late as May. A morphological study of the Scotch perithecia showed that they correspond closest to Ito's description of *Pyrenophora avenae* [ibid., x, p. 233], with which the fungus is identified, differences from Ratschlag's description of *Pleospora avenae* [ibid., x, p. 234] being noted in several respects. It is suggested that the divergences in Ratschlag's diagnosis are best ascribed to the artificial and presumably somewhat unfavourable conditions under which the perfect stage described by him developed.

BORZINI (G.). **Il 'carbone' del Granturco nell'annata 1934 nella regione dell'Agro Romano.** [Maize smut in 1934 in the region of Agro Romano.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 1, pp. 96–115, 1 graph, 1935. [English summary.]

Field studies [which are described, and the results of which are tabulated and discussed] on a severe outbreak of *Ustilago zeae* [*R.A.M.*, xiii, pp. 89, 226, 749] on seven-week-old maize near Rome in the summer of 1934 showed that precocity and irrigation each favoured infection, the early varieties Ideale and Saverio showing 14 and 23 per cent. infection, respectively, in the non-irrigated plots, as compared with 35 and 62 per cent., respectively, in the irrigated ones. The late varieties Nostrano dell' Isola Bassa and Mastodont growing in irrigated plots showed, respectively, 23 and 36 per cent. infection. In the irrigated plots the early varieties were mainly infected in the stem and tassels and the late ones on the leaves; in the non-irrigated plots most of the infections occurred in the male inflorescences. The severity of the outbreak was associated with high relative atmospheric humidity, rain at the end of June, small differences between the maximum and minimum daily temperatures, and strong winds [cf. ibid., v, p. 664; vii, p. 779].

SMITH (O. F.). **The influence of low temperature on seedling development in two inbred lines of Corn.**—*J. Amer. Soc. Agron.*, xxvii, 6, pp. 467–479, 2 figs., 4 graphs, 1935.

In a series of controlled greenhouse trials at the Wisconsin Agricultural Experiment Station seedlings of the RYD_4 inbred line of maize grown at a soil temperature of 16° C. were highly resistant to blight (*Gibberella saubinetii*) to which, on the other hand, those of GG_{26} proved very susceptible [cf. *R.A.M.*, viii, p. 376]. Seedlings of the

cross $RYD_4 \times GG_{26}$ proved more resistant than the F_1 progenies of the reciprocal cross.

Tu (C.) & Li (H. W.). **Breeding Millet resistant to smut in North China.**—*Phytopathology*, xxv, 6, pp. 648–649, 1935.

Of 1,430 head selections of millet (*Chaetochloa* [*Setaria*] *italica*) from various parts of Honan, North China, 192 remained free from smut (*Ustilago crameri*) [*R.A.M.*, xiii, p. 629], which caused losses up to 25 per cent. in 1932, in an inoculation experiment in 1933, while about 80 were more susceptible than the variety used as a control.

Kirby (G. W.), Frey (C. N.), & Atkin (L.). **The growth of Bread moulds as influenced by acidity.**—*Cereal Chem.*, xii, 3, pp. 244–255, 1 fig., 1935.

The results [which are discussed and tabulated] of experiments at the Fleischmann Laboratories, New York, on the relation of acidity to the growth of bread moulds (represented by *Aspergillus niger*) [*R.A.M.*, xii, p. 757; xiv, p. 383] indicated that in a liquid bread medium prepared from a mixture of 3 1 lb. loaves and 4 l. water at 35° C. the fungus exhibits no well-defined optimum for development with respect to the hydrogen-ion concentration range at which commercial bread is produced. The activity of the mould was not affected by the addition to the medium at P_H 3·5 of calcium acid phosphate, tartaric, phosphoric, lactic, or citric acids at 0·2, 0·4, or 0·6 per cent., whereas complete inhibition of growth followed the incorporation with the substratum of acetic acid at the same concentrations. The toxicity of acetic acid to *A. niger* was found to vary according to the acidity of the medium; the higher the latter, the lower the concentration of the disinfectant necessary for complete inhibition of growth. Ninety-grain 'distilled' vinegar, added to doughs at the rate of 0·5, 1, or 2 per cent. of the quantity of flour, was found to exert a preventive action on the growth of *A. niger* on finished baked loaves. This substance is commonly used at the two lower strengths for the prevention of 'ropiness'.

Weston (B. J.). **'June drop' of Citrus.**—*Cyprus* (*agric.*) *J.*, xxx, 2, pp. 43–44, 1935.

The abnormal shedding of immature citrus fruits known as 'June drop', and associated chiefly with an unbalanced water relationship at, and just before, blossoming lasts from May to July in Cyprus, where it frequently causes serious losses. Hot, dry winds aggravate the condition, which is further intensified by the local lack of soil moisture and available nitrogen during blossoming. The fluctuation from day to day (consequent on climatic factors) in the moisture content of the rapidly developing fruits leads to the formation of an abscission layer, with consequent yellowing and dropping, generally before a diameter of half an inch has been reached. Recommendations are made for control by the applications of manures and nitrogenous fertilizers, irrigation, and the provision of wind-breaks.

RUGGIERI (G.). **Una grave epidemia di marciume radicale fra gli Agrumeti di Fondi (Littoria).** [A serious epidemic of foot rot in the Citrus groves in Fondi (Littoria).]—*Ital. agric.*, lxxii, 6, pp. 515–518, 1 fig., 1935.

The author states that in the course of the last ten years orange groves in the Fondi district [northern border of the Campagna] have become increasingly affected with gummosis [the symptoms of which are very briefly described]. Isolations mainly yielded a species of *Phytophthora* apparently closely related to *P. parasitica* [*R.A.M.*, xiv, p. 506], as well as species of *Fusarium* either alone or in association with the former, the effect of the last-named organisms being to aggravate the symptoms. The epidemic spread of the disease, until at present the very existence of the groves is at stake, is considered to be due chiefly to the high susceptibility of the local orange and to the fact that it is grown almost exclusively on its own roots. The only certain means of eradicating the trouble is to replace the old affected trees by others grafted on sour orange stock, after disinfecting the holes with copper sulphate or with Bordeaux mixture. Since, however, growers avoid grafting the orange on such stocks, as they hold that the operation retards the seasonal development and produces fruits with a thick and coarse rind, the author discusses prophylactic measures in some detail.

CHAUDHURI (H.). **Infection by Colletotrichum gloeosporioides, Penz.**—*Proc. nat. Inst. Sci. India*, i, 2, pp. 71–75, 1 fig., 1935.

Spores of *Colletotrichum gloeosporioides* placed on the upper surface of Malta orange leaves produce on germination appressorium-like structures adhering firmly to the cuticle [*R.A.M.*, xii, p. 566]. At the same time certain products are secreted that react on the cuticle and the plasma membrane and diffuse into the underlying cells, filling them with water, before the occurrence of actual penetration. The injection of the cells with water was artificially induced by placing on the leaves for 30 to 40 hours drops of water in which spores had been allowed to germinate and then filtered off; on subsequent flooding with a dilute solution of erythrosin the dye was absorbed by the injected areas only. The fine, peg-like infection hyphae recorded by Dey [loc. cit.] were not observed, penetration being effected by ordinary germ-tube-like structures.

RUEHLE (G. D.). **Spraying for the control of Citrus scab.**—*Citrus Ind.*, xvi, 5, pp. 8–9, 17–18, 1935. [Abs. in *Chem. Abstr.*, xxix, 14, p. 4884, 1935.]

Consistently better control of citrus scab [*Sporotrichum citri*] was given [in Florida: *R.A.M.*, xiv, p. 578] by copper-containing than by sulphur and mercury fungicides, the most reliable and effective results being obtained with home-made Bordeaux mixture (3–4–50 plus 1 per cent. oil). Copper cyanamide was less efficacious and also caused a heavy increase in scale insect infestation. Basic copper sulphate sprays (1–5–50) gave promising indications, but Bordol-Mulsion (a proprietary copper-oil combination) proved inferior as a fungicide to Bordeaux

mixture; both these preparations, however, left less visible residue on the foliage than Bordeaux mixture and did not favour scale insects to the same extent as the latter. Lime-sulphur sprays, with the addition of kolofog or wettable sulphur [ibid., xiv, p. 591] arrested mild cases of scab but were less effective than the copper preparations against melanose [*Diaporthe citri*: ibid., xiv, p. 161] blemishes on fruit and foliage.

VENKATARAYAN (S. V.). **Control of anaberoga of Areca and Coco-nut Palms.**—*Mysore agric. Cal. 1935*, pp. 33, 37, 1 diag., 1935.

Anaberoga root disease of areca palms [*Areca catechu*: *R.A.M.*, xiii, p. 682] kills 15 to 20, and in severe outbreaks up to 60, trees per acre every year in areca gardens in Mysore, where it is probably general in the open, grassy areas. On coco-nuts the same condition [due to *Ganoderma lucidum*: ibid., xiv, p. 611] is present in the Honnavalli and Sira areas and near Arsikere, and appears to be spreading. Control measures consist in digging isolation trenches 1 ft. wide by 2 to 3 ft. deep and the burning of infected material.

GUILLIERMOND (A.). **Sur un champignon nouveau, parasite des capsules du Cotonnier, l'Eremothecium ashbyii et ses relations possibles avec le Spermophthora gossypii et les Ascomycètes.** [On a new fungus, *Eremothecium ashbyii*, parasitic on Cotton bolls, and its possible relationship to *Spermophthora gossypii* and the Ascomycetes.]—*C. R. Acad. Sci., Paris*, cc, 19, pp. 1556–1558, 1935.

Details are given of the author's studies of a fungus which was forwarded to him for identification by S. F. Ashby, and which had been originally collected by R. E. Massey on cotton bolls at Berber in the Sudan. On solid media the organism forms gelatinous, yellow colonies. The mycelium is more or less dichotomous, at first continuous but later divided by septa into plurinucleate cells of varying length. Numerous sporangia are formed at the end of 48 hours; when mature they are 68·2 to 87·5 by 14 to 15 μ in diameter and contain irregularly arranged spores, the number of which apparently varies from 4 to 32 (mostly 12 to 16). The spores measure 29 to 31·8 by 2 to 2·77 μ, are rounded or wedge-shaped at one end while the other end terminates in a very long, acute, and curved point, apparently devoid of cytoplasm. When transferred to fresh media the spores germinate at any point of their surface by a germ-tube which grows dichotomously and reproduces the original, sporangium-bearing mycelium.

Although in certain points it resembles *Ashbya* (*Nematospora*) *gossypii* [*R.A.M.*, x, p. 692; xiv, p. 507], the fungus is referred to the genus *Eremothecium* [ibid., v, p. 389] under the name *E. ashbyii* n.sp. [without a Latin diagnosis]. From a systematic standpoint it is stated that while the sporangia show a great resemblance to asci in the method in which the spores are differentiated, the fact that they are developed from plurinucleate cells precludes attributing to them the value of true asci. In conclusion the suggestion is advanced that the genera *Eremothecium* and *Nematospora* may be forms standing close to *Spermophthora* [ibid., xi, p. 606] which have lost the aptitude of producing zygospores [ibid., vii, p. 405], and that all the three genera

may represent an ancestral group of inferior Ascomycetes forming a transition between the Syphomycetes and true Ascomycetes. The author has found that *S. gossypii* has, during the eight years that he has had it in culture, lost the capacity for conjugation between the gametes, which germinate without fusion and give rise directly to the gametophytic generation.

PORGES (N.), MULLER (J. F.), & LOCKWOOD (L. B.). **A Mucor found in fowl.**—*Mycologia*, xxvii, 3, pp. 330–331, 1935.

This is a brief record of the constant association with a high-mortality epidemic of young chickens at the New Jersey Agricultural Experiment Station of a fungus which was isolated from the inflamed gizzard of the dead birds and which in pure culture produced luxuriant growth and sporulation of a *Mucor* allied to *M. hiemalis* [*R.A.M.*, xiv, p. 655] and *M. javanicus*. The species is thought probably to be a transitional form between the sub-genera *Mono-* and *Cymo-Mucor*, and is referred to *M. javanicus*.

GIORDANO (A.). **Rôle du 'Torulopsis neoformans' (Sanfelice) Red. en pathologie humaine.** [The role of *Torulopsis neoformans* (Sanfelice) Red. in human pathology.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 4, pp. 119–123, 1935.

A comparative study of the cultural, morphological, and biochemical characters of *Torula histolytica* Stoddard and Cutler (20 strains) [*R.A.M.*, xiv, p. 100], *T. nasalis* (= *Torulopsis neoformans* var. *nasalis*), *Torulopsis neoformans*, *T. hominis* (Vuill.) Red. (3 strains), *T. hominis* var. *honduriana* and *Blastomyces neoformans* entirely confirmed Lodder's conclusions as to the relationship of these organisms [ibid., xiv, p. 192] which, with three exceptions, were found to be identical and are referred to *T. neoformans* (Sanf.) Red. The exceptions were two of the strains ascribed to *Torula histolytica* (one of which proved to be a new variety of *Torulopsis neoformans* and is named var. *sheppei*, and the other had all the characters of a *Mycotorula*) and *T. neoformans* var. *nasalis* which had smaller blastospores than the type. A list of 16 synonyms of *T. neoformans* is cited by the author.

In culture on solid media *T. neoformans* forms a whitish, almost ochraceous-yellow, later brownish-yellow, ropy crust. In liquid media, spherical, oval, or elliptical blastospores are formed, rarely elongated, suggesting a rudimentary mycelium; large, round, chlamydospores are often produced in abundance and measure up to 10 μ in diameter. The organism does not liquefy gelatine, assimilates dextrose, levulose, maltose, and organic nitrogen, acidifies culture media, and is pathogenic to the rat, in which it causes well marked meningo-encephalitic granulomata.

OLÁH (D.). **Über die Schimmelpilze der erkrankten Haut und ihre Rolle bei der Entstehung, bzw. beim Verlauf verschiedener Hautkrankheiten.** [On the moulds of diseased skin and their role in the origin or course of various dermatoses.]—*Derm. Wschr.*, c, 25, pp. 703–712, 1935.

A tabulated account is given of the writer's studies during the last

three years in Hungary on 1,379 cultures from miscellaneous dermatoses, the results of which showed that various moulds are capable, not only of modifying the action of the fungi causing certain skin diseases but also of producing independent disturbances. Thus, *Acrostalagmus cinnabarinus* [*R.A.M.*, xiii, p. 769] has been found as a concomitant of *Microsporon audouini* [ibid., xiv, p. 102] in the hair, and refractory cases of eczema were associated, for instance, with *Cephalosporium acremonium* [ibid., viii, p. 783], *Monosporium engelhardti*, *Botrytis cinerea*, *Scopulariopsis brevicaulis* [ibid., xiv, p. 104], and *S. blochi*. These organisms may retard the cure of the conditions with which they are associated, either by their metabolic products or their vital processes. As regards the actual causation of pathological conditions by moulds, trichophytia profunda was twice found to be due to *A. cinnabarinus* (also found by A. Fazakas to be pathogenic to the eye) and once to *S.* (?) *blochi*. Evidence is adduced in support of these statements in view of which the term 'kerion' is considered preferable to 'trichophytia'. *B. cinerea* was repeatedly isolated from a superficial 'trichophytosis' of the chest and successfully inoculated into animals.

POWELL (H. M.) & JAMIESON (W. A.). **On merthiolate and fungi associated with ringworm.**—*Proc. Ind. Acad. Sci.*, xliii (*1933*), pp. 56–70, 7 figs., 1934.

A tabulated account is given of the writers' laboratory experiments with merthiolate [*R.A.M.*, xii, p. 509] in the control of three ringworm fungi, *Trichophyton purpureum*, *Epidermophyton* [*T.*] *rubrum* [loc. cit.], and *Microsporon lanosum*. In dilutions up to and including 1 in 10,000 the mercurial was found to be uniformly fungicidal to all three organisms; at 1 in 20,000 only the two last-named succumbed. Promising results were given by the incorporation of merthiolate in a semi-solid stearate cream consisting of triethanolamine and carbitol to facilitate its use in human mycotic skin disorders.

SARTORY (A.), SARTORY (R.), MEYER (J.), & WEISS (R.). **Étude d'un 'Cladosporium' nouveau 'Cladosporium tropicalis' n.sp. isolé d'une dermatomycose tropicale.** [A study of a new *Cladosporium*, *Cladosporium tropicalis* n.sp., isolated from a tropical dermatomycosis.]—*Bull. Acad. Méd. Paris*, cxiii, 24, pp. 890–892, 1935.

A species of *Cladosporium* isolated from cutaneous lesions on negro patients at Dr. A. Schweitzer's hospital, Lambaréné, French Equatorial Africa, is regarded as new and named *C. tropicalis*. On Sabouraud's maltose-glucose agar the fungus forms cerebriform, glistening, smooth colonies, brown at first, turning almost or entirely black; on Raulin's medium, on the other hand, a thick, greyish 'veil' is produced but no black pigment. The optimum temperature for growth on the latter substratum at P_H 6·2 was found to be 28° to 30° C. On unskimmed milk, which undergoes coagulation and peptonization, the colonies are orange. The thick-walled hyphae measure 4 to 9 μ in breadth, with individual segments 9 to 12 μ long, are sparsely branched, and give rise in liquid media to numerous round or oval yeast-like cells.

Reiss (F.). **Eine neue pathogene Hefe des Genus Mycotorula.** [A new pathogenic yeast of the genus *Mycotorula*.]—*Zbl. Bakt.*, Abt. 1 (*Orig.*), cxxxiv, 3–4, pp. 189–191, 3 figs., 1935.

From the sputum of a 44-year-old male patient suffering from bronchial pneumonia at Shanghai the writer isolated a yeast forming on glucose or malt beer agar, and liquid beer wort spherical to slightly elliptical spores, 6 to 10 μ in diameter, mostly proliferating by budding but occasionally extruding short pseudo-hyphae, and (in older cultures in potato water) relatively long mycelial elements with well-developed verticils, sometimes budding. The organism grew best at 37° C., but satisfactory development was also made at room temperature. The colonies were of a creamy consistency, whitish to yellowish, and readily separable from the substratum. Glucose, mannose, and levulose were utilized with resultant acid and gas production (most extensive in the case of mannose). Inoculation experiments on laboratory animals demonstrated the markedly pathogenic character of the yeast, which is considered to be a new species of *Mycotorula*, *M. sinensis* Reiss.

Moore (M.). **Cultivation and study of Pityrosporum ovale, the so-called bottle bacillus of Unna.**—*Arch. Derm. Syph., Chicago*, xxxi, 5, pp. 661–671, 1 fig., 1935.

Pityrosporum ovale [*R.A.M.*, xiv, p. 509] can be isolated from the scalp when seborrhaea is present, the substratum found to be most favourable being Difco wort agar with a P_H of 4·8. Growth becomes apparent on the third or fourth day, turning the greyish implanted scale creamy-white. In the scalp the fungus appears as an ovoid or spherical cell, with or without budding, 2 to 4 μ in the long axis or up to 11 μ in diameter. On 19 artificial media [the characters of the fungus on which are fully described] the dimensions are variable, thick-walled, spherical cells or chlamydospores up to 5 μ in diameter being formed on some. In several media elongated and sclerotic forms develop, as well as series of oidioid cells. The colour of the giant colonies varies according to the medium from a light ochraceous-salmon to a cinnamon-buff. Acid without gas was produced with galactose, dextrose, d-mannose, levulose, maltose, saccharose, and melitose. Gelatine was not liquefied or milk coagulated.

Briefly discussing the taxonomy of the organism, the writer considers the retention of the name *P. ovale* to be the wisest course in the present confused state of dermatological opinion on the subject.

Kharasch (M. S.) & Legault (R. R.). **The new active principle(s) of ergot.**—*Science*, N.S., lxxxi, 2112, pp. 614–615, 1935.

Evidence is adduced to show that the ergot [*Claviceps purpurea*] alkaloid described by Dudley and Moir under the name of 'ergometrine' [*R.A.M.*, xiv, p. 511 and next abstract] is not identical with ergotocin, which is stated to have been first separated from the 'known ergot alkaloids' by the writers in 1923. Analyses of pure ergotocin show a carbon content of 68·41 per cent. compared with 71·46 per cent. for ergometrine, while the physiological properties of the two substances, though similar in kind, differ appreciably in degree.

THOMPSON (M.). **The new active principle of ergot.**—*Science*, N.S., lxxxi, 2113, pp. 636–639, 1935.

The writer discusses his reasons (based on similarity of decomposition points and optical activity) for holding that ergometrine, ergotocin, and ergostetrine, ergot [*Claviceps purpurea*] alkaloids separated, respectively, by Dudley and Moir in England, Kharasch and Legault [see preceding abstract], and the writer in the United States, are one identical substance. Priority is claimed for the name 'ergostetrine' which was announced in May, 1934, but in any case it is considered highly desirable that this important new alkaloid should be known by a single name.

JARETZKY (R.). **Alkaloidgehalt und Wirksamkeit saprophytischer Mutterkornkulturen.** [Alkaloid content and efficacy of saprophytic ergot cultures.]—*Arch. Pharm., Berl.*, cclxxiii, 6, pp. 348–357, 2 graphs, 1935.

It has been estimated by the writer that the amount of ergot [*Claviceps purpurea*: see preceding abstracts] annually required by chemists and pharmacists in Germany is about 40,000 kg., of which only 1 per cent. is produced in the country. During the world-war, when the necessary quantities could not be procured from abroad, the shortage was unpleasantly felt, and in view of the present economic crisis it seemed advisable to explore the possibilities of production on a saprophytic substratum, for which a maltose-peptone-agar combination proved suitable [cf. *R.A.M.*, i, p. 422; viii, p. 561]. The results [which are tabulated and discussed] of preliminary experiments along these lines were extremely encouraging. The quantity of alkaloid produced by the fungus after 30 days' growth on the above-mentioned medium corresponded to 2·45 mg. ergotamin bitartrate—an amount equal to that yielded by 60 small sclerotia. Tested by its reversion of the action of adrenalin [ibid., xi, p. 39] the culture product gave completely satisfactory results.

SARTORY (A.), SARTORY (R.), MEYER (J.), & BAUMLI (H.). **Quelques champignons inférieurs destructeurs du papier.** [Some lower fungi destructive to paper.]—*Papier*, xxxviii, 6, pp. 529–530, 533–536, 539–542, 7 figs., 1935.

Further extensive studies [the results of which are fully discussed and the relevant statistical data tabulated] on the fungal destruction of paper [*R.A.M.*, xiv, p. 584] led to the following main conclusions. *Cladosporium herbarum* var. *cellulosae* and *Aspergillus fumigatus* var. *cellulosae* assimilate cellulose most actively on a medium containing neither additional carbohydrates nor organic nitrogen (peptone) but with 0·5 per cent. potassium nitrate, the process reaching a climax about the 60th day of culture by which time half the cellulose destroyed in 200 days has disappeared. Under similar conditions, however, the cellulolytic properties of *Fusarium coeruleum* are weak, this fungus definitely requiring organic nitrogen in the form of peptone or the like. Assimilation by *F. coeruleum* describes a slow but regular upward curve during the first 120 days and reaches an abrupt peak between the 120th and 150th, representing the consumption of 30 to 40 per

cent. of the total cellulose assimilated during the test. Under natural conditions *F. coeruleum* is the only one of these three that seems to feed directly on the cellulose by its morphologically normal, sterile hyphae. The damage by the other two is associated with the development of morphologically irregular reproductive organs.

Passing to the second group of cellulophagous fungi under observation, it was found that both *Actinomyces cellulosae* and *Monilia cellulosophaga* possess marked cellulolytic properties, the former being the more destructive of the two. Two peaks occur in the process of assimilation, one being reached at the 50th and the other towards the 150th day of culture.

Generally speaking, the various kinds of damage to paper observed in these studies are produced by the action of a single fungus, but occasionally two are associated, e.g., *F. coeruleum* with an apparently non-pathogenic *Stachybotrys* [ibid., xiv, p. 585], and *A. cellulosae* with *M. cellulosophaga.*

After a lengthy discussion of the morphological and physiological aspects of the fungal deterioration of paper, the writers proceed to a consideration of the factors involved in its occurrence. Foremost among these are the use of inadequately disinfected gums, washing of the whitened paste in polluted waters, and drying of the gummed and moistened paper in powerfully ventilated desiccators without proper arrangements for the disinfection of the air. The following mixture has been found to act as a valuable antiseptic for gum: mercuric chloride and vuzine (hydrocuprein), each at 0·02 per cent., silicofluoride and sunoxol [ibid., xi, p. 622], each at 0·05 per cent. *A. cellulosae* was found to be the most frequent contaminant during the winter and spring of the river water commonly used in the factories, whereas in summer and autumn *M. cellulosophaga* and *F. coeruleum* predominated. Filtration of such waters is therefore an important means of combating fungal disintegration of paper.

BUNYARD (G. N.). **Iris troubles.**—*Gdnrs' Chron.*, xcvii, 2531, pp. 430–431, 2 figs., 1935.

Popular notes are given on the symptoms and control of leaf spot and leaf rust of iris (*Heterosporium gracile* [*R.A.M.*, xiv, pp. 448, 586] and *Puccinia iridis* [ibid., xiii, p. 380], respectively), and also of two obscure conditions affecting the plant in England, namely, 'scorch' and rhizome rot, the former being more prevalent in dry, and the latter in wet, seasons. 'Scorched' plants are conspicuous by their flaccid, rust-brown leaves, shrunken, hard rhizomes, and dead roots. In cases of rhizome rot, the fans of foliage show brown zones, usually near the base, and later collapse; a very disagreeable odour is emitted by the rotten tissues at the junction of the rhizome and leaf fan, while the roots are also in an unhealthy state. An organism apparently identical with *Bacillus carotovorus* [ibid., x, p. 125] was isolated from the diseased rhizomes but failed to cause infection of healthy plants under controlled conditions, so that it is evidently not the primary agent of the rot. The condition of plants affected by both the last-named disorders may be improved by the excision of decayed material, removal of all roots, 20 minutes' immersion in Condy's fluid [potassium permanga-

nate], a few days' exposure to the sun, and transference to a selected site in a mixture of peat and sharp sand.

MATSUMOTO (T.). **Differentiation of two Petunia mosaic diseases by means of serological, cytological, and inoculation experiments.**—*Bot. & Zool.*, iii. 5, pp. 893–898, 3 figs., 1935. [Japanese.]

Two different types of *Petunia* mosaic [*R.A.M.*, v, p. 509; vi, p. 431; xii, p. 580] were observed at Taihoku, Japan, of which one (A) tends to exhibit more pronounced 'clearing of the veins' in the early stages of infection than (B). Other distinguishing features of the former are its specific serological reactions, absence of inclusion bodies, and mode of transmission. With regard to the last-named, type (B) shares with ordinary tobacco mosaic the property of transmission by the sap from petunia to tobacco and conversely [ibid., xiii, p. 192], whereas (A) is transmissible by the insertion of diseased leaf fragments into growing stems but not by expressed sap.

WALTER (MARTA). **Botrytisfäule an Kakteen.** [*Botrytis* rot of Cactaceae.]—*Ratschl. Haus, Garten, Feld*, x, 6, pp. 91–93, 1 fig., 1935.

A popular note is given on the rotting of Cactaceae and other succulents caused by *Botrytis cinerea* in the Munich district of Germany and its control by appropriate cultural measures, including the application to the soil of hakaphos (5 gm. per 10 l. water) or huminal tablets containing humic substances, nitrogen, phosphoric acid, and potash.

LEMESLE (R.). **Mycocécidie florale produite par le Fusarium moniliforme Sh. var. anthophilum (A. Br.) Wr. sur le Scabiosa succisa L.** [Floral mycocecidium caused by *Fusarium moniliforme* Sh. var. *anthophilum* (A. Br.) Wr. on *Scabiosa succisa* L.]—*Rev. gén. Bot.*, xlvii, 558, pp. 337–362, 3 pl., 13 figs., 1935.

After referring to his previous communications [*R.A.M.*, ix, p. 543; xii, p. 292; xiii, p. 448] on the infection of numerous *Scabiosa succisa* flowers in the neighbourhood of Nantes by *Fusarium anthophilum* (which has been recently reclassified by Wollenweber [ibid., x, p. 626] as *F. moniliforme* var. *anthophilum*), the author gives a fully illustrated account of his studies of the anatomical changes in the floral organs brought about by the invasion of the fungus. The results showed that the fungus, which was invariably found in the affected flowers, caused hypertrophy of the parenchyma of the involucels, of the walls of the ovary which failed to form a pericarp, and of the parenchyma of the styles. The ovules never developed, but the stamens always matured normally and the anthers always contained numerous pollen grains.

PALM (B. T.). **Pythium på vattenväxter.** [*Pythium* on aquatic plants.]—*Bot. Notiser, 1935*, 3–4, pp. 317–318, 1935. [English summary.]

Pythium de Baryanum has been found causing large, blackish lesions on *Nymphaea alba* and less extensive, greyish spots on *Sparganium simplex* and *Iris pseudacorus* in the water-lily ponds of the Lund Botanic Garden, this being apparently the first record of the fungus on aquatic plants. Repeated isolations were made in pure culture from the necrotic tissues of the affected hosts, and in the case of *N. alba* the pathogenicity

of *P. de Baryanum* was established by inoculation experiments and re-isolations from the resulting lesions.

Tandon (R. N.). **A note on the genus Mitteriella.**—*Curr. Sci.*, iii, 12, pp. 613–614, 7 figs., 1935.

In 1935, the author observed *Mitteriella zizyphina*, recently recorded on living leaves of *Zizyphus rotundifolia* in India [*R.A.M.*, xii, p. 395], growing vigorously on numerous branches and fruits on the same host, as well as on all the aerial parts of *Z. oenoplia* and the fruits of *Z. jujuba*. Infection was greatest during or after severe cold, and heavier on the sunny than on the shady side of the bushes.

Sampson (Kathleen). **The presence and absence of an endophytic fungus in Lolium temulentum and L. perenne.**—*Trans. Brit. mycol. Soc.*, xix, 4, pp. 337–343, 1935.

After referring to Miss McLennan's papers on the endophytic fungus of *Lolium* spp. [*R.A.M.*, v, p. 379], the author gives a tabulated account of her own observations during six consecutive seasons on the progeny of individual fungus-infected and fungus-free *L. temulentum* and *L. perenne* plants, the results of which showed that both species can exist either with or without the endophyte. In the infected plants the fungus invades the leaves, stems, tiller buds, and ovules, and in perennial plants is distributed by vegetative propagation. Reciprocal crossing of fungus-infected and fungus-free plants indicated that the organism is mechanically inherited from the female parent alone. The endophyte did not appear to invade the roots and is believed to be distinct from the Phycomycete type which has been recorded in these two species and other grasses, as well as in plants not closely related [cf. ibid., xiv, p. 248].

The investigation showed further that lines free from infection may arise from infected individuals, but the origin of the infected lines is still obscure, and the identity of the organism, as well as the biological aspects of its association with the grasses have still to be solved. The evidence at hand suggests, however, that the relationship is not an obligate one so far as the grasses are concerned.

Händler (E.). **Ergebnisse eines Fusikladiumbekämpfungsversuches vom Jahre 1934.** [Results of a *Fusicladium* control experiment of the year 1934.]—*Obst- u. Gemüseb.*, lxxxi, 5, pp. 68–70, 6 graphs, 1935.

Details are given of an experiment conducted in 1934 at the Horticultural Plant Protection Institute, Pillnitz, Saxony, in the combined control of apple scab (*Fusicladium*) [*Venturia inaequalis*: *R.A.M.*, xiv, p. 517] and codling moth [*Cydia pomonella*], on the basis of which the following general recommendations are made: (*a*) for four treatments: two applications of 1 per cent. Bordeaux mixture and two of 3 per cent. lime-sulphur (1) at the emergence of the buds, (2) just before the opening of the flower-buds, (3) after petal-fall, and (4) a month later; (*b*) for three treatments: three applications of Bordeaux mixture (1) 1 per cent., (3) and (4) 0·5 per cent.; urania (Bordeaux mixture and lead arsenate) (1) 1·5 per cent., (3) and (4) 1 per cent.; copper spray

'935' as for urania; Wacker's Bordeaux mixture [ibid., xiv, p. 371] (1) 1 per cent., (3) and (4) 0·75 per cent.; Bayer's Bordeaux [ibid., xiii, p. 449] (1) 1·5 per cent., (3) and (4) 1 per cent.; nosprasit 'O' [ibid., xiii, p. 776] (Bordeaux and arsenic) (1) 1 per cent., (3) and (4) 0·75 per cent.; and cupromaag [ibid., xiii, p. 582] (1) 0·2 per cent., (3) and (4) 0·15 per cent. The increase in sound fruits in the urania-treated plots amounted to 43 per cent.

Colhoun (J.) & Muskett (A. E.). **Fish eye rot of Apples.**—*Gdnrs' Chron.*, xcvii, 2530, pp. 418–419, 1 fig., 1935.

Attention is drawn to a mild and apparently isolated case of the fish-eye rot of Bramley's Seedling apples caused by *Corticium centrifugum* in County Armagh, Northern Ireland. This is believed to be the first record of the disease [the symptoms of which are briefly described] on home-grown apples in Great Britain or Ireland, though it was reported in 1931 from England on fruit imported from Canada [*R.A.M.*, x, p. 434], and has been known since 1903 in the United States. The fungus made good growth on 2 per cent. malt extract agar and other standard media, identification being facilitated by its sweet, aromatic, pungent odour and the typical clamp-connexions produced by the mycelium. Spores were not observed on the apples but were readily produced in culture on various media.

Harley (C. P.). **Water-core [of Apples].**—*Proc. Wash. St. hort. Ass.*, pp. 105–108, 1934. [Abs. in *Chem. Abstr.*, xxix, 15, pp. 5148–5149, 1935.]

In the early stages of water core [*R.A.M.*, xiv, pp. 243, 592] the affected apple tissues are characterized by rapid starch hydrolysis and a corresponding increase in soluble sugars and osmotic pressure [ibid., xi, p. 56]. After the tissues have been solidly water-cored for some time, the osmotic pressure remains high but the soluble sugars decrease and ethyl alcohol is formed to the extent of 1 per cent. by weight in severely diseased samples of certain varieties. Heavy applications of nitrogen intensify the incidence of water core, which is further promoted by conditions under which the conversion of starch into sugar is more rapid than manufacture of starch from sugar. Water core is most prevalent in Washington on the fruit of young trees or on that of older ones bearing a light crop where the ratio of leaves to fruit is high.

Kearns (H. G. H.), Marsh (R. W.), & Martin (H.). **Combined washes. Progress report.**—*Rep. agric. hort. Res. Sta. Bristol, 1934*, pp. 109–125 [1935].

In further tests at Long Ashton with combined insecticidal-fungicidal sprays [*R.A.M.*, xii, p. 774; xiii, p. 103], combinations of refined petroleum oil (1 per cent.) and lime-sulphur (1 per cent.) were used as post-blossom drenching sprays on a wide range of commercial apple varieties without damage. The addition of crystalline ferrous sulphate to lime-sulphur-lead arsenate at the rate of 5 lb. per gall. of lime-sulphur concentrate reduced the formation of soluble arsenate, obviated sludge production, and increased the visibility and adherence of the spray

deposit; as ferrous sulphate also liberates the monosulphide sulphur of lime-sulphur in the form of free sulphur it should further increase the fungicidal value of the mixture.

THOMAS (H. E.) & ARK (P. A.). **Fire blight of Pears and related plants.**—*Bull. Calif. agric. Exp. Sta.* 586, 43 pp., 7 figs., 1934. [Received July, 1935.]

This bulletin summarizes the information obtained up to date in the investigation of the fireblight (*Bacillus amylovorus*) [*R.A.M.*, xiv, p. 370] problem of pome fruits in California and elsewhere in the United States, and gives an additional list of 34 species of the Rosaceae which have been found to be susceptible to the disease; fireblight in severe form, however, appears to be restricted to a small number of plants closely allied to the pear and apple. Abundance of new infections in the spring depend to a considerably greater extent on the number of active cankers in the orchard than on external sources of infection. Further evidence is adduced to show that beehives infected with the fireblight organism are not a source of infection to the blossoms [ibid., xiv, p. 318], and that atmospheric humidity is important in the establishment and development of the disease chiefly through its effect on the quantity and sugar content of nectar [ibid., xiii, p. 707]. The bacteria present in fireblighted plant tissues were found to withstand air temperatures higher than those usually prevailing in Californian orchards during summer. It was shown in controlled experiments that the organism was not able to penetrate through three-day-old wounds in the pear roots.

In discussing control measures it is stated that a few growers obtained marked reduction in blossom blight by spraying the blossoms with weak Bordeaux mixture, but this method requires further testing.

A bibliography of 73 titles is appended.

GOIDÀNICH (G.). **Una nuova specie di 'Ophiostoma' vivente sul Pero ed alcune osservazioni sull'esatta posizione sistematica della forma ascofora e delle forme metagenetiche del genere.** [A new species of *Ophiostoma* living on Pear and some observations on the exact systematic position of the ascigerous form and the metagenetic forms of the genus.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 1, pp. 122–168, 19 figs., 1935. [English summary.]

In this paper the author gives an exhaustive account of his investigations into the morphological, cultural, sexual, anatomical, and pathological characters and the systematic position of a fungus isolated from decaying pear plants and named by him [with Latin diagnoses] *Ophiostoma catonianum* [*R.A.M.*, xiv, p. 274] G. Goid. n.sp., Stilbaceous form, *Graphium pirinum* G. Goid., n.sp., Mucedinaceous form, *Hyalodendron pirinum* G. Goid. n.sp. The fungus is homothallic; in monospore cultures from the ascospores as well as from conidia perithecia were always obtained. In its anatomical structure it is near the Perisporiales and cannot be referred to Saccardo's genus *Ceratostomella* [cf. *R.A.M.*, xiv, p. 274, and below, p. 726]; the fertile zone of the ascocarp is localized in the centre of the perithecium and is surrounded by a layer of sterile cells.

The author agrees with Nannfeldt [loc. cit.] in considering that the species ascribed to *Ceratostomella* and having the characters of *O. catonianum* should be kept distinct, the correct genetic name for them being *Ophiostoma* Syd. He transfers to *Ophiostomella* Petr. the species *Ceratostoma pirinum* Ade as *O. pirina* (Ade) G. Goid., and also probably the genus *Chaetoceratostoma* Turc. & Maff., *Ophiostomella* being included in the Ophiostomataceae Nannf. and occupying the same position in regard to *Ceratostoma* that *Ophiostoma* occupies in regard to *Ceratostomella*. On *C. penicillata* Grosmann [ibid., xii, p. 409] a new genus *Grosmania* G. Goid. is based, the metagenetic form of which is *Scopularia penicillata* (Gros.) G. Goid. *Ophiostoma lignorum* (Wr.) G. Goid. and *O. majus* (v. Beyma) G. Goid. [ibid., xiv, p. 471], formerly referred to *Ceratostomella*, are further transfers to *Ophiostoma*. *Hyalodendron* [ibid., xiv, p. 69] is believed to be the Mucedinaceous form of *Ophiostoma*.

According to a new scheme of classification of the genus *Graphium* the Stilbaceae that are metagenetic forms of *Ophiostoma* remain in it, while the others are distributed among *Nematographium* n.g. G. Goid., *Pleurographium* n.g. G. Goid., and *Graphiopsis* Bainier.

Henrick (J. O.). **Brown rot of stone fruits, Sclerotinia cinerea (Bon.) Schroet., syn.: Monilia cinerea (Bon.).**—*Tasm. J. Agric.*, vi (N.S.), 2, pp. 73–79, 4 figs., 1935.

The author states that the brown rot fungus (*Sclerotinia cinerea*) [*S. laxa*; but cf. *R.A.M.*, vi, p. 619 and next abstract: = ?*S. fructicola*] is present in Tasmania, in normal years causing negligible losses to peaches, apricots, nectarines, plums, and cherries. During the 1934–5 season, however, in many instances the rot assumed epidemic proportions in northern Tasmania, where conditions were favourable to the fungus. This fact, as well as the possibility that the trouble may gain in intensity throughout Tasmania, impels the author to give general recommendations for its control, most of which are well known in practice.

Harrison (T. H.). **Brown rot of fruits and associated diseases of deciduous fruit trees. II. The apothecia of the causal organisms.**—*J. roy. Soc. N.S.W.*, lxviii, pp. 154–176, 1 pl., 1 fig., 1935.

Continuing his studies on the three species of *Sclerotinia* associated with brown rot of fruits and related diseases of the trees [*R.A.M.*, xiii, p. 33], the author gives a comprehensive account of his critical examination of the various records of their apothecia. While Aderhold's and Ruhland's description of *S. fructigena* is stated to be still the most complete available so far, the apothecia described in 1912 by Westerdijk from Holland and those described in 1931 by Solkina from the U.S.S.R. [ibid., xi, p. 310] are both referred to this species, and an additional record of the fungus on mummified apple in 1919 in Bologna, Italy, is also confirmed from the author's examination of the specimens. Weber's statement of the occurrence of the apothecial stage in Denmark [ibid., v, p. 559], on the other hand, was impossible to substantiate, as there appear to be no specimens preserved.

Aderhold's and Ruhland's record of *S. laxa* and that of Wormald of

S. cinerea in 1921 are cited as two excellent descriptions of the same fungus for which the name *S. laxa* is preferred; an additional collection of the fungus in England in 1932 is also described in some detail. In 1930 numerous apothecia on mummified wild plums were found in the Caucasus by J. G. Dickson, the incomplete evidence at hand indicating that they belonged either to *S. laxa* or *S. fructigena*, or to both.

A brief review is given of the numerous existing records of *S. fructicola*, which are supplemented by critical observations of the fungus in the United States and Australia.

A comparative examination of the apothecia of *S. laxa* and *S. fructicola* suggested that they are morphologically indistinguishable from each other, but the striking differences between the two species in the imperfect stage warrant their separation, and further evidence in this connexion is reserved for later publication.

Harrison (T. H.). **Brown rot of fruits and associated diseases in Australia. II. An interesting Discomycete, Sclerotinia aestivalis Pollock, occurring on mummified fruits.**—*Mycologia*, xxvii, 3, pp. 302–318, 1 pl., 2 figs., 1935.

An account is given of the author's studies of apothecia which were found in 1921 in Australia on apricot mummies in an orchard in which, earlier in the year, apothecia of *Sclerotinia fructicola* [at the time thought to be probably a form of *S. fructigena*: *R.A.M.*, ii, p. 120] were obtained from similarly mummified apricots. These proved to be identical with Pollock's *S. aestivalis* reported from Michigan in 1909. In New South Wales the apothecia have been found very abundantly on mummified apples, apricots, peaches, pears, plums, and quinces. They have also been abundantly obtained in monospore cultures on a wide range of media in the laboratory in Australia, England, and America, some of which were maintained fruiting for 13 years. In spite of repeated attempts the macroconidial stage was never produced on any of the media or under any of the conditions tested. The fungus was shown to be a saprophyte for all practical purposes, although it caused a very slow rot of apples under favourable conditions of growth; it is suggested, however, that it may possibly be parasitic on the pseudosclerotium of *S. fructicola*. Whetzel, to whom the fungus was submitted, considers that it is a typical *Ciboria*, and on his authority the author suggests for it the new combination *C. aestivalis* (Pollock) Whetzel.

Manns (T. F.) & Manns (M. M.). **Plums as factors in the dissemination of yellows and little Peach.**—*Trans. Peninsula hort. Soc.*, xxiv (*1934*), pp. 72–76, 3 figs., 1935.

From Nebraska eastwards the plum hopper (*Macropsis trimaculata*), previously shown to be the vector of peach yellows and little peach [see above, p. 682], has been found in all the peach-growing States. Observations made on peach, plum, apricot, and cherry branches from twelve different States showed that the Jassid feeds most freely on plums, the Japanese *Prunus salicina* being more heavily infested than the European (*P. domestica*) or American (*P. americana*) varieties. Peach and apricot were occasionally infested in unsprayed areas, but not cherry. It has already been experimentally shown that Oriental

plum varieties are capable of masking the symptoms of yellows and little peach and of living for years after infection [ibid., xiii, p. 564]. This is particularly true of the Abundance, Chalco, and Chabot varieties of *P. salicina*, while the Satsuma, Santa Rosa, and Red June varieties of the same species show an inward rolling of the leaves without much impairment of their vitality.

HARTZELL (A.). **A study of Peach yellows and its insect vector.**—*Contr. Boyce Thompson Inst.*, vii, 2, pp. 183–207, 4 pl., 1 diag., 2 graphs, 2 maps, 1935.

In this account of investigations in the United States over a number of years into peach yellows [see preceding abstract] the author reports transmission by infected leafhoppers (*Macropsis trimaculata*) [*R.A.M.*, xiv, p. 498] in 14 out of 84 peach trees, all of 75 controls remaining healthy. Forty-seven other insects and mites tested failed to transmit the disease. The first symptoms appeared between 42 and 268 days (average 147 days) from feeding. Of the one-year-old trees exposed to the leafhoppers only 3·6 per cent. became diseased, as compared with 32·2 per cent. of the trees three years old or more. Both nymphs and adults were capable of transmission. Of the trees exposed before and after 23rd June, 36·4 and under 10 per cent., respectively, became diseased. The incubation period in the insect did not exceed 22 and 32 days for nymphs and adults, respectively; when both were used the average was 25 days. The insect hibernates in the egg stage in the bark of wild plum (*Prunus americana*) and there appears to be one generation a year. The shyness of this species and its small numbers, combined with the fact that it is normally found on plum rather than peach, have probably delayed its recognition as the vector of peach yellows. As compared with other leafhoppers of economic importance *M. trimaculata* is a rare species.

Transmission was also effected by budding, but not by means of diseased pollen or mechanical inoculation.

The principal host of *M. trimaculata* is *P. americana*, which was found in orchards that consistently showed a high incidence of yellows in spite of the careful removal of the diseased peaches. The known distribution of the insect in the United States roughly corresponds with that of the disease.

The removal of *P. americana* from the vicinity of peach orchards, combined with roguing, would assist in control [ibid., vii, p. 792].

BEVILACQUA (I.). **Una grave infezione nei Ciliegi.** [A serious infection of Cherries.]—*Istria agric.*, N.S., xv, 11, pp. 252–254, 1935.

In the spring of 1935 cherries growing in the north coastal area of Istria were widely attacked by the blossom wilt due to *Sclerotinia cinerea* [*S. laxa*: *R.A.M.*, xiii, p. 33], the disease being particularly severe on a late local variety, 'Bolana'. Flowering began normally, but once the flowers had opened completely their development became arrested and they withered in a few days. On all the trees the extremities of some of the branches dried up.

The control measures recommended consist in the removal of all infected material in spring and winter and spraying with 1 per cent.

Bordeaux mixture or a solution of Caffaro powder at the strength of 1 kg. to 100 l. of water [ibid., xii, p. 707], when the buds swell and again when the flowers are about to open.

McNew (G. L.) & Bliss (D. E.). **Control of Cherry yellow-leaf on nursery stock.**—*Bull. Ia agric. Exp. Sta.* 332, pp. 155–184, 9 figs., 10 graphs, 1935.

In spraying and dusting trials [which are described and the resulting data tabulated] conducted in Iowa with numerous fungicides against *Coccomyces hiemalis* on cherry nursery stock [*R.A.M.*, xiv, p. 497], only home-made Bordeaux mixture (4–6–50) gave consistently profitable results. The evidence obtained showed that the trees should be sprayed at approximately 10-day intervals (frequency depending on the weather conditions) from the time the plants are 6 to 12 in. high until the growing season is over. The best dust tested was kolodust, which in 1931, when the rainfall was light, gave as good results as Bordeaux mixture.

Pittman (H. A.). **Fig leaf mottle.**—*J. Dep. Agric. W. Aust.*, 2nd Ser., xii, 2, p. 196, 1935.

Figs in Western Australia are becoming every year more widely attacked by a leaf mottle, characterized by a mosaic-like pattern of light green or yellowish and dark green patches, frequently accompanied by distortion and malformation. The first crop of figs often falls prematurely, and occasionally the development of much of the second crop is curtailed. The cause of the disease has not been determined but considerable improvement is effected by adding 1 to 4 lb. (according to the size of the tree) of finely crushed copper sulphate to the soil, applying it all round the tree at a distance of about 1 ft. from the trunk, as far out as the branches extend. The treatment should be carried out preferably in autumn after the heavy rains have started, but it can be applied at any other time, provided the soil is moist. Subsequent applications at one-quarter the rate of the first should be made each succeeding autumn.

Nattrass (R. M.). **Diseases of the Olive.**—*Cyprus (agric.) J.*, xxx, 2, pp. 55–57, 1935.

Olives in Cyprus are not severely affected by diseases, those most commonly present being leaf spot or blotch (*Cycloconium oleaginum*) [*R.A.M.*, xii, p. 522], sooty mould [cf. ibid., vii, p. 187], Dalmatian disease (*Macrophoma dalmatica*) [*Sphaeropsis dalmatica*: ibid., xiii, p. 587; xiv, p. 83], and olive knot [*Pseudomonas savastanoi*: ibid., xiv, p. 643], of which only the last is of much importance. Leaf spot can be controlled by spraying with Bordeaux mixture before flowering and after the fruit has been picked, though this is seldom necessary or profitable; the trees should be pruned to let in air and light, should not be planted in low-lying, undrained localities, and should not be given any excess of nitrogenous manures. Dalmatian disease may also be controlled by the same methods and precautions. Against olive knot no direct treatment is known [cf. ibid., xii, p. 522]; when a grove is planted, all the planting stock should be free from galls,

similar care being taken when grafting with the scions. Once the trees have become attacked the twigs and branches bearing the galls should be excised, the cuts being made well below the gall to avoid contamination of the knife. The removal of galls, as well as ordinary pruning, should be effected in summer when no bacterial exudation is present. Branches that rub against one another should be removed, and the fruit picked with as little damage to the tree as possible.

HORNE (W. T.). **Avocado diseases in California.**—*Bull. Calif. agric. Exp. Sta.* 585, 72 pp., 34 figs., 1934. [Received August, 1935.]

In this useful and well-illustrated bulletin the author gives a comprehensive account of the major parasitic diseases and physiological troubles of the avocado pear in California, among which the following may be mentioned: sun blotch [*R.A.M.*, xi, p. 314]; sooty spots on green stems, leaves, and fruits, caused by a species of *Helminthosporium*; anthracnose or withertip, believed to be caused by *Colletotrichum gloeosporioides* [ibid., xiii, p. 456]; stem and root cankers which experiments indicate to be probably caused by *Phytophthora cactorum*, *P. parasitica*, or *P. citrophthora*; root rot (*Armillaria mellea*); blast of immature fruits (*Bacterium* [*Pseudomonas*] *syringae*) [ibid., x, p. 96; xii, p. 376]; and rots of harvested fruits associated with *Rhizopus nigricans*, *Botryosphaeria ribis* [var.] *chromogena* [cf. ibid., xii, p. 633], *C. gloeosporioides*, and other miscellaneous organisms, including species of *Alternaria*, *Cladosporium*, *Fusarium*, *Pestalozzia*, *Penicillium expansum*, and *Phytophthora citrophthora*. Control measures are suggested whenever information is available.

ROARK (R. C.). **Insecticides and fungicides.**—*Industr. Engng Chem.*, xxvii, 5, pp. 530–532, 1 map, 1935.

This article is concerned mainly with insecticides, but the following references are made to the use of fungicides for checking fungal and bacterial injuries to plants, &c., in the United States, where the losses from these sources are estimated at $1,000,000,000 per annum [cf. *R.A.M.*, xiv, p. 461]. During 1934 the approximate consumption in the United States of some standard disinfectants was as follows: lime-sulphur (dry) 43,000,000 lb., sulphur dust 30,000,000 lb., creosote oil 10,000,000 galls., petroleum oil 20,000,000 galls., copper sulphate 12,000,000 lb., zinc chloride 18,000,000 lb., and sodium fluoride 4,000,000 lb.

Copper, mercury, zinc, and sulphur have remained the only fungicides in general use for half a century. The usefulness as seed disinfectants of the organic compounds of mercury is restricted by their high toxicity to man [ibid., xiv, p. 552]. Attention is directed to the strong bactericidal capacity of various alkyl phenols [ibid., xiv, pp. 584, 632], which might serve equally well as fungicides.

Kemiska medel i växtparasitbekämpningens tjänst. [Chemical preparations for the control of plant parasites.]—*Flygbl. Växtskyddsanst., Stockh.* 12, 11 pp., 1 diag., 1934. [Received August, 1935.]

This is a revised edition of pamphlet No. 4 in the same series [*R.A.M.* xiii, p. 112], dealing in popular terms with the composition and applica-

tions under Swedish conditions of some standard fungicides and insecticides, exclusive of those employed in the treatment of seed-grain [see above, p. 687].

FROST (K. R.). **The design of a double-piston pressure regulator for spray pumps.**—*Agric. Engng St. Joseph, Mich.*, xvi, 6, pp. 227–228, 1 fig., 1 diag., 1 graph, 1935.

Details are given of a double-piston pressure regulator for orchard spray pumps [cf. *R.A.M.*, xiii, p. 113; xiv, p. 369] which has been devised in California to remedy various defects inherent in the standard type. The new regulator is stated to lower the by-pass pressure and h.p. consumption to 50 per cent. of that ordinarily required. It is simpler to use since there is no need to compress the spring, or adjust the valve stem for clearance, as in the standard type. A saving of trouble and expense should also result from the large by-pass apertures and the elimination of ball valves and stems liable to abrasion and corrosion.

WILSON (J. D.) & RUNNELS (H. A.). **The relation of time to the effect of Bordeaux mixture on transpiration.**—*Bi-m. Bull. Ohio agric. Exp. Sta.* 174, pp. 120–124, 2 graphs, 1935.

Continuing their studies on the effect of Bordeaux mixture on the transpiration of sprayed plants [*R.A.M.*, xiv, p. 459], the authors give an account of laboratory experiments, the results of which showed that in *Coleus* plants a marked increase in transpiration occurred immediately after the drying of the spray on the leaves, in many instances the increase becoming greater each following night for at least four nights. In one series the maximum increase occurred on the fourth night after spraying, regardless of whether the plants were sprayed with freshly prepared or four-day-old Bordeaux mixture, but the latter material did not cause as great an increase as the former. The effect decreased rapidly from the fifth to the eighth night, and more gradually from the ninth to the twelfth, on which the sprayed plants still lost more water than the controls.

BESSEY (E. A.). **A text-book of mycology.**—xv+495 pp., 139 figs., Philadelphia, P. Blakiston's Son & Co., Inc., 1935.

In this work, which aims at providing first-year students in mycology and plant pathology with some idea of the structure, life-history, and classification of the more important fungi, the physiological aspects of the subject-matter are subordinated to the morphological, ontogenetical, and systematic. Attention is given to recent studies on sexuality, one chapter consists of a bibliographical guide to the literature of identification, and each includes a section on phylogeny and a bibliography of its subject-matter. Most of the illustrations are from recent works.

WOLLENWEBER (H. W.) & REINKING (O. A.). **Die Fusarien; ihre Beschreibung, Schadwirkung und Bekämpfung.** [The *Fusaria*; their description, injurious effects, and control.]—viii+355 pp., 95 figs., Berlin, P. Parey, 1935.

The first half (pp. 1–141) of this valuable and welcome book is devoted to the systematics of the genus in the restricted sense as

delimited by the senior author in his earlier monograph [cf. *R.A.M.*, x, p. 626]. Critical descriptions are given of the 65 species, 55 varieties, and 22 forms in all of the 16 groups into which the genus has been divided [loc. cit.], together with the related known perfect stages. Keys are provided for each group.

Further experience of the range of variability of some of the type species has resulted in a reduction of the number of forms. In the *Roseum* group, *Fusarium herbarum* on grounds of priority has been merged in *F. avenaceum* of which two varieties and one form are recognized. Some forms of varieties of *F. lateritium* are no longer maintained. In the group *Elegans* the three sub-groups *Orthocera*, *Constrictum*, and *Oxysporum* are retained but some of the agents of vascular wilt diseases are transferred from 'forms' to varieties, e.g., the cause of banana wilt is recorded as *F. oxysporum* v. *cubense* instead of *F. oxysporum* forms 3 and 4. In the group *Liseola* the varieties '*majus*' and '*erumpens*' are now merged in *F. moniliforme*, the perfect stage of which is recorded as *Gibberella fujikuroi* (Saw.) Wr. with *G. moniliformis* (Sh.) Winel. as a synonym.

In the second half of the book (pp. 142–316) descriptions are given of the *Fusaria* as the cause of diseases of plants, the botanical names of the hosts being arranged in alphabetical order. The most serious diseases are treated in considerable detail and references to the more important papers are given under each host. This part of the book will be especially welcome to plant pathologists.

A very complete list of the synonyms and homonyms of the genus in the alphabetical order of the species precedes a full and convenient index (with the main page references in thick type).

MOLANDER (A. R.). **Nya iakttagelser över förekomsten av Zostera marina utmed svenska kusten.** [New observations on the occurrence of *Zostera marina* along the Swedish coast.]—*Ny svensk Fiskeritidskr., 1934*, 21, pp. 243–245, 1934.

Particulars are given of the condition of *Zostera marina* in Swedish waters in relation to the wasting disease [*R.A.M.*, xiv, p. 600]. Along the Bohuslän coast extensive destruction has taken place, but there are indications of recovery, especially in relatively fresh water. No sign of deterioration has been detected from the Warberg tract to the Sound, a noteworthy fact in view of the Danish reports as to the occurrence of wasting along the Kattegat and Skagerack [ibid., xiv, p. 326]. Hydrographic factors are considered probably to account for this distribution, the salinity of the Swedish coastal waters being reduced by a freshening influx from the Baltic which counteracts the tendency to wastage.

GASCHEN (H.). **Présence de flagellés dans le latex d'une Apocynacée d'Indochine.** [The presence of flagellates in the latex of one of the Apocynaceae of Indo-China.]—*C.R. Soc. Biol., Paris*, cxix, 19, pp. 356–357, 1935.

Attention is drawn to the presence in the stems of *Strophanthus balansae*, a laticiferous member of the Apocynaceae, growing in calcareous soil on a rocky mountain slope in Tonkin, Indo-China, of

flagellates of the genus *Leptomonas*, the bodies measuring on an average 13·9 μ and the flagella 8·2 μ [cf. *R.A.M.*, v, p. 760: xiii, p. 254]. In common with other plant flagellates, the species under observation is characterized by torsion of the body on its longitudinal axis and a small blepharoplast from which the flagellum is detached directly.

GHIMPU (V.). **Infinitul mic in patologia vegetala: ultravirusurile fitopatogene.** [The infinitely small in plant pathology: plant pathogenic ultraviruses.]—Reprinted from *Viața agric.*, *1935*, 5, 10 pp., 13 figs., 1935.

This is a brief, semi-popular review of our present knowledge of the virus diseases of crop plants, most of which has been noticed from time to time in this *Review*. Reference is made to the economic importance of the diseases for some of the major crops in various parts of the world.

REED (H. S.) & FRÉMONT (THÉRÈSE). **Factors that influence the formation and development of mycorrhizal associations in Citrus roots.**—*Phytopathology*, xxv, 6, pp. 645–647, 1 fig., 1935.

Continuing their investigations in California on the factors involved in the mycorrhizal infection of orange trees [*R.A.M.*, xiii, p. 764], the writers found that roots growing in soils deprived of fertilizers for the preceding seven years showed little capacity to resist invasion or digest the intracellular hyphae, so that in such cases the endophyte behaved as a true parasite. It developed principally in the form of intercellular mycelium, sending into the cortical parenchyma cells short, sparsely branched hyphae differing little from the intercellular ones and with their ends often in contact with the nuclei. Where sodium nitrate was the only fertilizer applied there was no development of the 'mycorrhiza cells', in which infection is followed by digestion, the cortical cells were abnormally large and reacted in an exaggerated way to penetration by the endophyte, and the trees were generally unthrifty, suffering severely from 'mottle leaf' [ibid., xiv, p. 628]. Profound metabolic disturbances were indicated by the accumulation of phenolic precipitates in the root cells, and there was no evidence of a beneficial association between host and fungus.

In soils adequately fertilized with organic nitrogen in appropriate forms root infection occurs mainly during growth in the spring, whereas the roots of unfertilized trees contain the endophyte at all seasons. In the former there was comparatively little intracellular mycelium other than the arbuscles, and the entry of the fungus appeared to promote an active response in the cell, the cytoplasm of which became spongy, enveloped the arbuscles, and was rich in mitochondria.

HANSEN (H. N.) & SMITH (R. E.). **The origin of new types of imperfect fungi from interspecific co-cultures.**—*Zbl. Bakt.*, Abt. 2, xcii, 8–12, pp. 272–279, 5 figs., 1 diag., 1935.

Following a brief account of their production of heterogenic types of *Botrytis cinerea* by the mixture of two homogenic strains of the fungus in the same culture [*R.A.M.*, xii, p. 316], the writers give details of similar experiments in which *B. allii* [ibid., ix, p. 82; xii, p. 109;

xiv, p. 553] and *B. ricini* were grown in 'co-cultures' (intentional mixtures or combinations of different types of organism in one culture) on potato-dextrose agar and their progeny analysed by single-spore methods through successive generations.

Of 20 monospore isolations from the original mixed culture, 6 were identical with *B. allii*, 9 with *B. ricini*, and 5 quite distinct from either. From these aberrant cultures three types were segregated by repeated single-sporing and selection that appeared sufficiently different from the parents to warrant varietal or even specific rank. These types have remained constant through five monospore culture series. Gene changes induced in some way, not yet fully elucidated, by interspecific anastomosis are thought to be responsible for the production of aberrant homotypes in *Botrytis*.

CORNER (E. J. H.). **Observations on resistance to powdery mildews.**— *New Phytol.*, xxxiv, 3, pp. 180–200, 2 figs., 1935.

A summarized account is given of investigations in 1928 at Cambridge to determine the stage at which infection by the powdery mildews of cereals (*Erysiphe graminis*) [*R.A.M.*, xii, p. 620; xiii, p. 719], the apple (*Podosphaera leucotricha*) [ibid., xiv, p. 639], and the rose (*Sphaerotheca pannosa*) is checked on resistant varieties of the host plants. It was shown that on susceptible hosts (Wilhelmina wheat, Spratt Archer barley, and *Agropyron repens*) the conidia of *E. graminis* germinate by producing from near one end a straight or somewhat flexuous, clavate, primary germ-tube, 20 to 40 by 3 μ at the base to 4·5 to 6 μ at the apex, which, after having established a haustorium close to or at its apex, continues its apical growth as an ordinary hypha. The original 'germ-tube portion' becomes the first cell, and haustoria are subsequently formed from the third, fourth, or fifth cells of the hypha, rarely, if ever, from the second. At the same time, two to four secondary germ-tubes arise from near the ends of the conidium, which develop into hyphae and produce haustoria from their third to fourth cells, rarely from the second, and apparently never from the first. The short, tapering, tertiary germ-tubes, which may also arise from any part of the conidium, are generally abortive; old conidia may only produce these, and some of them may form abortive haustoria. Two to five laterals subsequently develop from the cell which was the primary germ-tube.

At the end of 24 hours from inoculation, at about 20° C. and in a saturated atmosphere, penetration of the host cells is just beginning, and after 48 hours the first haustoria are more or less fully grown and one or two secondary germ-tubes may have been formed. After 72 hours a fairly extensive mycelium has developed, and after 96 hours conidial chains are produced. The cell wall is penetrated and the haustorium develops in the way described by Grant Smith (*Bot. Gaz.*, xxix, p. 153, 1900) and Foëx [*R.A.M.*, iv, p. 152]. A stylar process from the germ-tube pierces the cuticle (which is not micro-chemically affected), and its passage through the cellulose layer, clearly altered around the point of penetration, is preceded by a local internal swelling of the layer into a papilla; this is eventually pierced at the apex by the process, whereupon the haustorium gradually enlarges into the mature organ. On the partially resistant Norka wheat, germination

of *E. graminis* conidia proceeded normally for 24 to 36 hours, up to the formation of the infection papilla, after which penetration was usually checked and the conidium and germ-tube died. In a few cases, however, a small haustorium was formed, a small infection focus developing slowly for five or six days, after which it died off. In three cases, which were not studied further, a normal mycelium with full-sized haustoria developed exactly as on the susceptible hosts, and conidia were produced after 120 hours. On the resistant Black Persian wheat the conidia germinated as described above and the germ-tubes developed to the papilla stage, but neither haustoria nor secondary germ-tubes were formed, and the conidia gradually died.

The same sequence of events also applied to the germination and development of *P. leucotricha* and *S. pannosa* on susceptible and resistant varieties of apple and rose, respectively.

The results of cross-inoculations with the physiologic forms of *E. graminis* from wheat, barley, and *A. repens*, as well as inoculation experiments with *P. leucotricha* and *S. pannosa* (corroborated by a few tests with *Oidium euonymi-japonici* and *E. cichoracearum*) on inappropriate hosts showed that in every case the conidia germinated and initiated penetration to the papilla stage, when the process was stopped and no haustoria were formed. These results are considered to indicate that the tip of the germ-tube and the appressoria must respond thigmotropically to contact with the epidermis of the host, there being as yet no evidence for positive chemotropism. The penetration of the cuticle is evidently mechanical, while that of the cellulose layer is both mechanical and chemical. The whole investigation is interpreted to indicate that resistance to the powdery mildews is primarily caused by toxins in the host cell, but that environmental and structural factors may also be operative, at least in cases of subinfection.

Kaliaeff (A.), Kravtchenko (A.), & Smirnova (Mme N.). **Zum Problem der erworbenen Immunität bei Pflanzen. Vakzination der Bohnen gegen den Pilz Toile.** [A contribution to the problem of acquired immunity in plants. Bean 'vaccination' against the 'toile' fungus.]—*Zbl. Bakt.*, Abt. 2, xcii, 8–12, pp. 209–220, 1935.

By means of the addition to soil or water cultures of Phoenix, Golden Rain, and Mitchinskaia beans [*Phaseolus vulgaris*] of the filtrate from a bouillon culture of the 'toile' fungus (*Botrytis cinerea*) [*R.A.M.*, xiv, p. 188], it was possible, at the Moscow Microbiological Research Institute, to induce enhanced resistance to subsequent infection. In one of the experiments described the plants were germinated on filter paper and then transferred to flasks containing Knop's nutrient solution. To some of the flasks 10 per cent. of an undiluted filtrate from a four-week-old culture of *B. cinerea* on malt bouillon was added, while others (controls) received no addition. Eight days later the plants were transferred to fresh Knop's solution (without culture filtrate), and after another four days all were inoculated by inserting a piece of mycelium from a four-day-old culture of the fungus and kept for two or three days in a moist chamber before uncovering. In 13 days after inoculation 32 of the 84 'vaccinated' plants had collapsed from the attack of the fungus (38 per cent.), while 66 of the 81 controls had

collapsed and another 10 wilted without rotting, or 93·8 per cent. in all. The average survival figures for 'vaccinated' and control plants in the several experiments described were 42·2 and 4·3 per cent., respectively, in a total of 283 'vaccinated' and 235 control plants, and the deaths occurred earlier in the latter. The resistance of the treated plants was not impaired by the arrested growth and damaged root system caused by 'vaccination', which at the same time conferred a heightened vitality expressed in the vigorous development of the cambium, protoxylem, and in some cases of the pericycle. The most intense reaction to 'vaccination' was manifested by plants that had survived infection. Both the untreated and 'vaccinated' plants succumbing to the attacks of the fungus (90·2 and 55·1 per cent., respectively, in all series, excluding those that wilted without rotting) were characterized by the virtual absence of secondary cambium. The cambium of the 'vaccinated' plants that survived formed a closed ring of several layers at a time when that of the controls was still incomplete.

Carbone (D.) & Alexandri (A. V.). **Recherches sur les anticorps chez les végétaux.** [Researches on antibodies in vegetables.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 6, pp. 221–223, 1935.

After referring to the failure of earlier investigations on plant immunity to demonstrate the presence of antibodies in plants inoculated with various bacteria [*R.A.M.*, v, p. 347; vi, p. 110; x, p. 689; xii, p. 496 *et passim*] the authors state that they repeated the series of experiments described by Mlle T. Frémont as giving positive results [ibid., xiv, p. 78], inoculating cultures of *Bacterium* [*Bacillus*] *proteus vulgaris* and *Bact. prodigiosum* [*Bacillus prodigiosus*] into the pith cavity of broad beans [*Vicia faba*], haricot beans [*Phaseolus vulgaris*], and lentils at 1-, 2-, and 3-day intervals, and extracting, centrifuging, and filtering the cellular fluid. Repeated attempts, however, to show the presence of agglutinins by Frémont's method, using an emulsion of living bacteria in a physiological solution, and of precipitins by adding the plant extracts to the filtrates of the bacterial cultures, all gave negative results.

Spooner (E. T. C.) & Bawden (F. C.). **Experiments on the serological reactions of the Potato virus 'X'.**—*Brit. J. exp. Biol.*, xvi, pp. 218–230, 2 figs., 1935.

The results of the serological studies briefly reported in this paper showed that the saps of tobacco (White Burley), *Nicotiana glutinosa, Datura stramonium,* and potato (President and Up-to-Date) infected with the potato virus X [*R.A.M.*, xiv, p. 605] contain a common antigen obtainable in stable suspension by MacClement's purification method [ibid., xiii, p. 647], which gives virus preparations of high infectivity. The antigen flocculates and fixes complement with the sera of rabbits inoculated with the sap of infected potatoes, either crude or purified by carbon dioxide, but not with normal rabbit serum or the sera of rabbits inoculated with healthy tobacco sap. The anti-virus sera in 1 in 10 dilution neutralized the infectivity of purified virus suspensions, whereas anti-healthy-tobacco and normal

rabbit sera did not. Both anti-virus and anti-healthy-tobacco sera were shown to contain small quantities of antibodies to normal tobacco antigens, the presence of which was not demonstrable in purified virus preparations, and the normal antigen was found to be common to healthy tobacco and healthy *D. stramonium* leaves.

The investigation also indicated that the virus antigen is specific to the potato virus X and to the closely related potato virus 'D' [ibid., xiv, p. 329], as it was not found to be present in the sap of tobacco infected with the other tobacco or potato viruses studied. It is closely associated with the infectivity of the virus, since both were removed by the same grade of collodion membranes. No antigenic differences were found between different strains of the X virus.

PORTER (D. R.). **Relation of virus diseases to Potato production in California.**—*Bull. Calif. agric. Exp. Sta.* 587, 32 pp., 13 figs., 6 diags., 1935.

After a brief, popular account of the virus diseases of potatoes and their economic importance in California, details are given of investigations started in 1929 to test the possibility of developing healthy potato seed production in that State by the tuber indexing (tuber-unit) system [*R.A.M.*, xiv, p. 525, the technique of which is briefly described]. The results showed that in many districts masking of the symptoms of certain of the virus diseases is common, this rendering effective roguing practically impossible. In every district examined the virus diseases spread rapidly during one growing season, unless the seed plot was well isolated or the planting was delayed until the middle of June or later. Control of the insect vectors was found to be insufficiently beneficial to warrant its use in practice. Comparatively little field spread of the diseases occurred when plants were grown during periods of extreme heat, common in the interior of California from June to September, but owing to the symptom-masking effect of heat, the seed used in planting must be practically free from the virus diseases. Potentially high-yielding seed may be produced in the California Delta by planting in March or April in plots carefully isolated from external infection.

HITCHCOCK (J. A.). **The economics of certified seed Potato production I. The seed Potato enterprise.**—*Bull. Vt agric. Exp. Sta.* 370, 36 pp., 7 graphs, 2 maps, 1934. [Received August, 1935.]

Certification of seed potato stocks on the basis of field inspection of the growing crop, with a view to the elimination of seed-borne (especially virus) diseases [cf. preceding abstract] was inaugurated in Vermont in 1914, and underwent rapid expansion from 1918 to 1922, since when its development has been slow. To determine the conditions and methods of management promoting successful potato cultivation and to appraise the possibilities of the latter in the State are the objects of a study of which this bulletin reports a part of the results.

The data used comprise 359 seed potato enterprise records secured by the survey method, 119 for 1928, 127 for 1929, and 113 for 1930, representing in all 218 farms. The average cost of growing and harvesting an acre of potatoes was estimated at \$158 in 1928, \$156 in 1929,

and $171 in 1930. The average yields for the three years were 210, 245, and 310 bushels, respectively, making the average cost per bushel of marketable potatoes 74, 63, and 54 cents. Spraying and dusting materials accounted for 7 per cent. of the total expenditure, machinery (chiefly spraying and dusting equipment) and miscellaneous items (including seed disinfectants and inspection fees), 6 per cent. each.

THOMSON (R.). **Potato-growing in New Zealand. Part I. Advice to growers in regard to the maintenance of pure and healthy seed stocks.**—*N.Z. J. Agric.*, l, 5, pp. 257–268, 4 figs., 1935.

After briefly reviewing the work of the Department of Agriculture, New Zealand, in inaugurating a system of potato seed certification [*R.A.M.*, vii, pp. 389, 736], the author gives brief directions for the maintenance of pure and healthy seed stocks by roguing, and adds short, popular descriptions of the prevalent virus diseases, viz., leaf roll, mosaic, crinkle, stipple-streak, and spindle sprout, as well as of other conditions adversely affecting the crops, as an aid to their recognition. Recommendations are made for applying fertilizers and handling the seed.

HÜLSENBERG (H.). **Beobachtungen zum Auftreten des Kartoffelkrebses.** [Observations on the occurrence of Potato wart.]—*Mitt. Landw., Berl.*, l, 17, pp. 359–360, 1935.

The writer briefly discusses various difficulties involved in the enforcement of the regulations against potato wart [*Synchytrium endobioticum*] in the Prussian district of Schleusingen in the Province of Saxony [*R.A.M.*, xiii, p. 544]. The ignorance of the local peasantry is largely responsible for the widespread reluctance to procure certified seed of immune varieties, suspicions as to the genuineness of which have also been aroused by the dealings of unscrupulous traders. Involuntary confusion of immune and susceptible varieties is further apt to arise through the similar appearance, especially as regards skin colour, of both groups, and the restricted storage facilities do not permit of adequate separation. It is considered to be urgently necessary to educate the rural population in this matter.

VAN EVERDINGEN (E.). **Het verband tusschen de weergesteldheid en de Aardappelziekte (tweede mededeeling).** [The relation between weather conditions and Potato blight (second note).]—*Tijdschr. PlZiekt.*, xli, 6, pp. 125–133, 1935.

Continuing his studies on the relation between weather conditions and potato blight [*Phytophthora infestans*: *R.A.M.*, v, p. 627], the writer finds that, in general, the results of observations covering the period from 1928 to 1933 confirm his previous data regarding the critical factors in the inception and development of epidemics [see above, p. 676].

In 1932, 1933, and 1934 the critical days in Holland numbered 15, 13, and 18, respectively. The mean minimum humidity in the dry year 1934 (when a number of the critical days were not followed by an outbreak of blight) during the week following the critical days was only 61 per cent., the corresponding figures for 1933 and 1932 being

68 and 61 per cent., respectively. The average duration of sunshine for the four days following the critical ones in 1934 was 27 hours, as compared with 18 and 21 in 1933 and 1932, respectively. Assuming light winds to be conducive to the spread of blight, 7 to 8 of the 15 critical days in 1932, 9 to 10 of the 13 in 1933, and 7 to 8 of the 18 in 1934 may be regarded as favourable, but the whole problem of wind velocity in relation to the disease requires further investigation.

Recent foreign literature on the meteorological aspects of potato blight is concisely summarized and discussed, with special reference to the work of Beaumont (*Rep. agric. met. Conf., Minist. Agric.*, p. 12, 1931) [cf. also *R.A.M.*, xi, p. 559] and Wiltshire [ibid., xi, p. 123] in England, and of Crosier [ibid., xiii, p. 724] and others in the United States. The author agrees with Wiltshire that further studies should be directed to an examination of the factors of sunshine, wind, and humidity in the potato fields themselves.

MADER (E. O.) & BLODGETT (F. M.). **Potato spraying and Potato scab.**—*Amer. Potato J.*, xii, 6, pp. 137–142, 1935.

For the past two years a marked reduction in the incidence of potato scab [*Actinomyces scabies*] at Pittsford, New York, has been obtained in certain fields by spraying with Bordeaux mixture (from 27 to 7·8 and from 38·8 to 4·4 per cent. in two tests in 1934). Various explanations of this unexpected result (which was incidental to a study of the effect of the fungicide on foliage and tuber development) are offered. Spraying may have delayed tuber-setting and enlargement until a period of relatively high soil moisture, thereby reducing the amount of infection, a probable consequence also of the higher total nitrogen and copper content of the sprayed plants. Schaal has recently shown that flea-beetle [*Epitrix cucumeris*] larvae may act as vectors of *A. scabies* [*R.A.M.*, xiv, p. 118], inoculation of the tubers with which would be automatically reduced by treatment inimical to the insects. The wilting of sprayed plants in hot weather [ibid., xiv, p. 460] may induce a general 'hardening' conferring resistance to scab.

COUPAN (G.). **Appareils pour le poudrage de la Pomme de terre.** [Potato-dusting apparatus.]—*J. Agric. prat., Paris*, N.S., xcix, 29, pp. 55–57, 1935.

Details are given of the construction and application of a number of knapsack and traction potato-dusting apparatus exhibited and tested at Rennes (Ille-et-Vilaine) on 7th and 8th June, 1935. The potatoes were treated with 'Standard' copper-arsenic dust. The following are the deliveries and area covered per hour by the different machines. (A) Knapsack: (1) Stella (P. Perras, Belleville-sur-Saône, Rhône) 16 kg., 0·18 hect.; (2) Vermorel (Villefranche-sur-Saône, Rhône) Blufina and (3) Bluette, 21 kg., 0·19 hect. and 28·5 kg., 0·21 hect., respectively; (4) Berthoud (Belleville-sur-Saône) high delivery, 31 kg., 0·22 hect. (B) Traction without motor: (1) Berthoud Flux, 28 kg., 1·21 hect.; (2) Vermorel Aquilon, 19 kg., 1·10 hect. (C) Motor traction: Herzog (Jouzac, Charente-Inférieure), 34 kg., 2·17 hect. The criticisms of the judges on the various types of apparatus are briefly summarized.

CHAMBERLAIN (E. E.). **Verticillium-wilt of Potatoes. Its relation to stem-end discoloration of the tubers, and suggested measures for control.**—*N.Z. J. Agric.*, l, 6, pp. 321–327, 3 figs., 1935.

After a brief reference to the considerable reduction in the yield of potato crops in New Zealand caused by the *Verticillium albo-atrum* wilt [*R.A.M.*, xiv, p. 466], the author gives details of experiments, the results of which showed that there is little correlation between the discoloration of the vascular system in the stem-end of potato tubers and the presence in the latter of *V. albo-atrum* mycelium. Such discolorations should not, therefore, be used to determine the percentage of infection with wilt in a line of potatoes used as seed. Another series of experiments indicated that counts of wilted plants in the field is the most reliable method so far found for determining the amount of wilt in a crop, although it does not give the real percentage of tuber infection, which may vary considerably from one season to another.

It is suggested that the most effective method for the elimination of the disease, with particular reference to seed plots, is a three- or four-year crop rotation, together with the roguing of infected plants, including the plants on either side of the diseased one.

EHRKE (G.). **Untersuchungen über die Eisenfleckigkeit der Kartoffel.** [Investigations on 'Eisenfleckigkeit' of the Potato.]—*Biochem. Z.*, cclxxviii, 3–4, pp. 195–225, 3 figs., 1 diag., 9 graphs, 1935.

The writer's extensive researches [the methods and results of which are fully described and tabulated] showed that among the biochemical and metabolic changes induced in Datura, Konsum, Erdgold, Sickingen, and Sämling [Seedling] potato tubers by 'Eisenfleckigkeit' in Berlin [*R.A.M.*, xiv, p. 389] are an increase in the oxidase and peroxidase, glutathion, manganese, and iron contents, as well as in fermentative and diastatic activity, and a decrease in dry weight, albumin, starch, and ascorbic acid. Under equable weather conditions the disease failed to develop in the progeny even of severely infected tubers on the light, sandy soils favouring its occurrence, whereas abnormal fluctuations produced the symptoms even in plants from healthy tubers. In heavy soils, on the other hand, the plants remained healthy, even where the seed tubers were diseased and the weather was conducive to the appearance of the disorder.

DASTUR (J. F.). **Diseases of Pan (Piper betle) in the Central Provinces.**—*Proc. Indian Acad. Sci.*, i, 11, pp. 778–815, 3 pl., 4 figs., 1935.

After a review of the various methods of cultivation of the betel vine (*Piper betle*) in the Central Provinces and Berar (India), the author gives a detailed account of the most important diseases of the crop there. The chief is a foot rot which is known to occur in epidemic form in many parts of the Central Provinces and some parts of Berar, and is caused by a strain of *Phytophthora* considered to be a new variety of *P. parasitica* [cf. *R.A.M.*, xiv, p. 122] which is named var. *piperina*; it differs from the type species in its larger oogonia (20·4 to 40·8 μ, average 33·4 μ, in diameter) and its larger oospores (17·8 to 53·1 μ, average 20·1 μ). The fungus readily infected seedlings of *Ricinus communis*, *Vinca rosea*, and *Martynia diandra*, but not *Colocasia antiquorum*. In a few localities of the Central Provinces the fungus also causes a serious leaf rot of betel vines.

In Timarni (Hoshangabad district) a destructive foot rot was found to be caused by an apparently hitherto undescribed species of *Pythium*, which is named *P. piperinum*, with an English diagnosis. It is characterized by globular, non-papillate sporangia measuring 12·5 to 20·4 μ (average 16·4 μ) in diameter. The zoospores are formed either inside or outside the sporangia (discharge occurs either through an opening in the sporangial wall or through a discharge tube) and are at the most 12 in number, spherical, generally uni- but sometimes bi-ciliate, and measure 3·4 to 5·1 μ (cilia 4·6 to 10·1 μ in length). The oogonia are spherical or sub-spherical, terminal, lateral, or intercalary, smooth, thin-walled, hyaline, and 15·3 to 25·5 μ (average 19·3 μ) in diameter. The antheridia are one to many per oogonium, borne terminally or laterally on a separate hypha or on the oogonium-bearing hypha. The oospores (invariably only one per oogonium) are smooth, thick-walled, hyaline or slightly yellow, spherical, almost filling the oogonium, and 12·75 to 20·4 μ (average 16·6 μ) in diameter; they are formed after fertilization or parthenogenetically.

A destructive anthracnose caused by two unidentified species of *Colletotrichum* was found in only a few centres in the Central Provinces. Experiments showed that the foot rots could be controlled by treating the soil round the bases of the plants with Bordeaux mixture [ibid., xi, p. 283], and the anthracnose by spraying the plants with Bordeaux mixture or bouisol [ibid., xiv, p. 533].

Isolations from foot rot-affected plants also yielded *Sclerotium rolfsii*, *Rhizoctonia bataticola* [*Macrophomina phaseoli*], and *R.* [*Corticium*] *solani*, but the evidence indicates that these fungi are only weakly parasitic and do not cause much damage to betel vines.

SUMMERS (E. M.) & RANDS (R. D.). **Losses due to planting of mosaic diseased seed Cane.**—*Sug. Bull.*, xiii, 15, pp. 2–6, 1935.

The field spread of sugar-cane mosaic in Louisiana [*R.A.M.*, xiv, p. 394] is stated to have reached epidemic proportions during the last two years, coincident with the rapid extension in the cultivation of the susceptible Co. 281 variety. Co. 290 is also gradually contracting a severe type of infection, whereas C[anal] P[oint] 807 and 28/19 have remained almost uniformly immune from the disease, the chief losses from which thus fall on the extensive areas of Co. 281 and P.O.J. 234.

The writers' data indicate that both syrup- and sugar-producers run the risk of heavy losses from the planting of infected seed-cane; in the case of Co. 281 seed pieces should be procured exclusively from areas showing less than 5 per cent. mosaic. Great importance is attached to the rehabilitation of Co. 281, the outstanding qualities of which, including resistance to red rot [*Colletotrichum falcatum*: ibid., xiv, p. 470], do not appear to be shared by any of the mosaic-immune varieties.

CAMINHA (A.). **Co. 290 Cane at Campos, Brazil. Observations on Cane culture in Brazil.**—*Brasil Assuc.*, v, 3, pp. 127–138; 4, pp. 335–341, 1935. [? Portuguese. Abs. in *Facts ab. Sug.*, xxx, 8, pp. 304, 305, 1935.]

Contrary to the results obtained in other districts, the Co. 290 sugar-cane variety is stated to have done well at the Campos Experimental

Station, Brazil. Though susceptible to mosaic [see preceding abstract], it is more tolerant of the disease than Co. 213, besides being resistant to various forms of root rot [*R.A.M.*, xiv, p. 532]. Generally speaking, the mosaic problem in Brazil [ibid., ix, p. 807] has been solved by the introduction of certain Java varieties, of which P.O.J. 36 and 213 have transformed the São Paulo sugar industry during the last eight years. In 1925 the production in that state had fallen to 220,000 sacks (of 60 kg.), due to mosaic and traditional methods of cultivation; by 1933 it had risen to 2,400,000 sacks. In Rio de Janeiro the average cane yield in 1927 was 25 tons per hect., with a factory yield of 7·5 per cent. sugar, while the corresponding figures in 1934 were 60 tons and 9·5 per cent., respectively. Both P.O.J. 36 and 213 are best adapted to the comparatively temperate zones, such as São Paulo and Argentina [ibid., xiv, p. 394], and readily lose their resistance to mosaic (especially P.O.J. 36) in hot, humid climates. P.O.J. 979 may exhibit mosaic symptoms from the time of germination and is tolerant of the disease up to the age of four or five months, after which period it gradually acquires resistance. P.O.J. 2174, 2727, and 2878 show no susceptibility to mosaic, scarcely a sign of which has been observed in the last-named during six years' cultivation at Campos. P.O.J. 2725 is fairly susceptible, but does well at elevations of over 300 m. above sea level. Kassoer seems to be the only variety absolutely immune from mosaic.

HIRATSUKA (N.). **Notes on Japanese rust fungi (VI).**—*J. Jap. Bot.*, xi, 5, pp. 330–334, 1 fig., 1935. [Japanese.]

This annotated list of twelve Japanese rusts [cf. *R.A.M.*, xiv, p. 533] contains a Latin diagnosis of *Puccinia rhei-undulati* (Diet.) Hiratsuka nov. comb., the teleuto stage of *Uredo rhei-undulati*, found on cultivated rhubarb (*Rheum rhaponticum*) and *R. undulatum*. It is characterized by small, round, scattered, blackish-brown teleutosori and ellipsoid or oblong, chestnut-brown, smooth teleutospores, 30 to 40 by 15 to 20 μ, with a rounded, much thickened apex (7 to 10 μ), a tapering or subrotund base, slightly constricted at the septum, and having a hyaline pedicel up to 45 μ long. *Paliurus ramosissimus* is infected by *Phakopsora zizyphi-vulgaris* [ibid., xii, p. 396].

WATANABE (T.). **New host plants of Corticium centrifugum in Nippon.**—Reprinted from *J. agric. Res. Soc. Utsunomiya agric. Coll., 1935*, 10, 4 pp., 4 figs., 1935.

A list is given of 24 recently detected hosts (mostly ornamentals such as *Iris*, *Yucca*, *Phlox*, and *Pentstemon*, or weeds, but also including *Lagenaria vulgaris* var. *depressa* and rhubarb) of *Corticium centrifugum* (*Sclerotium rolfsii*) in Japan [*R.A.M.*, xiii, p. 6; xiv, p. 399 and above, p. 701].

WERNHAM (C. C.). **A species of Sorodiscus on Heteranthera.**—*Mycologia*, xxvii, 3, pp. 262–273, 2 pl., 1 fig., 1 map, 1935.

The author describes a new species of the genus *Sorodiscus* [cf. *R.A.M.*, xiii, p. 60], which he names *S. heterantherae* [with an English diagnosis], found causing prominent, dark olive-brown to black galls, 0·5 to 3 cm. in diameter, with finger-like projections 0·5 to 1·5 cm. in

length, on the true and adventitious roots of *Heteranthera dubia* in lakes and streams of the St. Lawrence basin. The organism is believed to be possibly identical with the fungus described under the name *Membranosorus heterantherae* by Ostenfeld and Petersen (*Z. Bot.*, xxiii, pp. 13–18, 1930).

MARCHIONATTO (J. B.). **Argentine Republic: species of Fusarium existing in the country.**—*Int. Bull. Pl. Prot.*, ix, 6, p. 125, 1935.

A study by C. Carrera of the species of *Fusarium* occurring in Argentina has revealed the presence of the following: *F. equiseti* and *F. culmorum* on peas [*R.A.M.*, xiii, p. 613]; *F. scirpi* var. *caudatum* [ibid., xiii, pp. 493, 593] on pepper [*Capsicum annuum*]; *F. heterosporum* [ibid., xiii, p. 385] and its var. *lolii* on *Spartina*; *F. culmorum* var. *cereale* on barley; *F. graminearum* [*Gibberella saubinetii*] on wheat [ibid., xii, p. 683]; *F. moniliforme* [*G. moniliformis*] on maize [ibid., xi, p. 505]; *F. poae* [ibid., xiv, p. 512] on wheat; and *F. lini* on flax [ibid., xi, p. 300].

TUNSTALL (A. C.). **A new species of Glomerella on Camellia thea.**—*Trans. Brit. mycol. Soc.*, xix, 4, pp. 331–336, 1 pl., 1 fig., 1935.

A brief account [including Latin and English diagnoses] is given of an apparently hitherto undescribed fungus which has been frequently isolated throughout the tea-growing areas of north-east India from externally sound wood in the vicinity of rotting lesions, and from dead wood, on tea branches, and which is named *Glomerella major* n.sp. The fungus occurs on tea both in the conidial (*Colletotrichum*) and ascigerous stages, the former being most frequent on material collected during the rainy season, when the perfect stage is markedly rarer. Apart from other minor differences, the fungus differs from *G. cingulata* [*R.A.M.*, xiii, p. 540] chiefly in the dimensions of its fructifications. The conidia are mostly cylindrical with rounded ends, occasionally slightly curved, 1- to 3-septate at germination, and measure 14·4 to 30·6 by 3·8 to 9·6 μ (mean 24·8 by 7·7 μ). The conidiophores are simple or branched, brown-walled, clavate, 2- to 3-septate, about twice the length of the spores. The setae are brown to opaque brown, subacute, up to 4-septate, and 100 to 200 by 4·5 to 5 μ. The perithecia develop in a stroma beneath the periderm, and either remain immersed or become erumpent; they are very variable in shape and measure from 130 to 150 μ in diameter; beaked ostioles are commonly present with or without an apical tuft of brown hairs; the beaks, when present, are cylindrical or subconical, and measure up to 160 by 100 μ. The asci are clearly defined only when immature, and measure, when mature, about 70 to 110 by 10 to 18 μ. Paraphyses are not present. The ascospores (usually eight to the ascus) are elliptical with obtuse or subacute tips, frequently slightly inequilateral, usually becoming brown when released into the perithecial cavity, and measure 15·6 to 30·1 by 5·5 to 8·4 μ (mean 24·9 by 7 μ). The ascospores sometimes germinate *in situ*, becoming 1- to 2-septate, rarely 3-septate.

The fact that, apart from its almost invariable association with die-back of tea branches, the fungus was also frequently found in apparently

healthy branches strongly suggests that vigorous tea plants show considerable resistance to injury from its attacks. The same also appears to apply to *G. cingulata*, which in north-east India causes noticeable injury only to tea plants weakened by other causes.

STANLEY (W. M.). **Isolation of a crystalline protein possessing the properties of Tobacco-mosaic virus.**—*Science*, N.S., lxxxi, 2113, pp. 644–645, 1935.

A crystalline material, containing 20 per cent. nitrogen and 1 per cent. ash and having the properties of the tobacco mosaic virus, is stated to have been isolated at the Rockefeller Institute for Medical Research from the juice of Turkish tobacco plants infected by this virus. The procedure was as follows. Ammonium sulphate was added to the juice until a concentration of 0·4 saturation was obtained. The globulin precipitate was filtered off and repeatedly fractionated with ammonium sulphate; most of the remaining colour was removed by precipitation with lead acetate at P_H 8·7. An inactive protein fraction was removed from the light yellow filtrate by adjusting to P_H 4·5 and adding 2 per cent. of celite. The celite was removed, suspended in water, and the suspension filtered. The active protein was found in the filtrate. This treatment was repeated twice to remove completely the inactive protein and crystallization accomplished by the addition of 1 c.c. glacial acetic acid in 20 c.c. of 0·5 saturated ammonium sulphate to a faintly turbid ammonium sulphate solution of the protein.

Judged by the number of lesions produced on the leaves of Early Golden Cluster beans [*Phaseolus vulgaris*], *Nicotiana glutinosa*, or *N. langsdorffii* [*R.A.M.*, xiv, p. 601], the crystals are over 100 times more active than the suspension made by grinding up diseased tobacco leaves, and about 1,000 times more potent than the twice-frozen juice from infected plants. Typical mosaic infection is usually produced by 1 c.c. of a 1 to 1,000,000,000 dilution of the crystals. The injection of solutions of the crystals into animals causes the production of a precipitin active for the same solutions and for the juice of virus-infected, but not of normal, plants. The protein readily passes a Berkefeld 'W' filter, but collodion filters which fail to allow it to pass also prevent the passage of the virus.

The material herein described is considered to differ in every respect from the substances isolated by Vinson and Petre [ibid., xiv, p. 609] and by Barton-Wright and McBain, which Caldwell has shown [ibid., xiii, p. 475] to consist largely of organic matter totally unconnected with the activity of the products.

There is considered to be strong evidence that the crystalline protein is either pure or a solid solution of proteins. The tobacco mosaic virus is regarded as an autocatalytic protein presumably requiring the presence of living cells for multiplication.

THORNBERRY (H. H.). **Quantitative studies on the filtration of Tobacco-mosaic virus.**—*Phytopathology*, xxv, 6, pp. 601–617, 1935.

When various dilutions of the tobacco mosaic virus [see preceding and next abstracts] in distilled water were passed through Berkefeld

'W' filters the infectivity of the filtrate as compared with the similarly diluted unfiltered juice, judged by the average number of local lesions on bean [*Phaseolus vulgaris*] leaves, was greatest at the maximum dilution tested of 1×10^{-3} (15 per cent. more infections than the unfiltered sample), owing evidently to the fact that a greater percentage of the virus filters through at high than at low dilutions. The filterability of the virus through Berkefeld 'W' candles was found to be influenced by the reaction of the medium (0·1 mol. disodium phosphate). At P_H 8·5 it is completely filterable, at 1·5 non-filterable, and at intermediate values capable of partial filtration. Evidence was obtained that the retention of the infective principle at the extreme acid reaction is due to the clogging of the filter pores. Virus adsorbed to the filters from an acid suspension may be readily eluted in 0·1 mol. disodium phosphate buffer at P_H 8·5, some 80 per cent. being released in 10 c.c. The filtration of the virus at P_H 8·5 through Berkefeld 'W' candles increased its infectivity by 66 per cent. *Bacillus prodigiosus*, the diameter of which is given by Bergey (Manual of Determinative Bacteriology, 4th ed., 1934) as 500 to 1,000 $\mu\mu$, was found to pass filters with a pore size of 12 μ, but not through Berkefeld 'V' filters with a pore size of 10 μ. Using Bechhold's acetic collodion membranes [*R.A.M.*, xiii, p. 588], the tobacco mosaic virus at P_H 8·5 just passed through those of 0·270 to 0·311 μ maximum pore size, but was retained by those with pore diameters of 0·187 to 0·218 μ, on which basis its dimensions may be assumed to be 8 to 15 times smaller than the size of the pores allowing filtration (as Bechhold found for bacteria), or of the order of 18 to 38 $\mu\mu$.

THORNBERRY (H. H.). **Effect of phosphate buffers on infectivity of Tobacco-mosaic virus.**—*Phytopathology*, xxv, 6, pp. 618–627, 1 graph, 1935.

The infectivity of Johnson's No. 1 tobacco mosaic virus at a dilution of 1×10^{-2}, as judged by the average number of local lesions on Scotia bean [*Phaseolus vulgaris*] leaves [see preceding abstracts], was increased by 229, 353, and 411 per cent., respectively, by 0·1 mol. ammonium, sodium, and potassium dibasic phosphate at P_H 7·2, 8·5, and 8·5, respectively. Trisodium phosphate at P_H 11·2 inactivated the virus, the infectivity of which was further greatly reduced by sodium carbonate at P_H 5. At all concentrations tested aluminium chloride and sulphate strongly diminished or inhibited infectivity (91 and 99 per cent., respectively, at 0·1 mol.). None of the other salts [which are listed] used in the experiments had any appreciable action on the infectivity of the virus up to 0·1 mol., above which concentration, however, all that were soluble to that extent reduced its virulence. No evidence was obtained that infectivity was influenced by the valency of the anion or cation. The optimum hydrogen-ion range for the infection of beans by a 1×10^{-2} dilution of the virus was found to extend from P_H 7 to 8·5. The virus was not inactivated by one hour's exposure between P_H 1·5 and 9, reactions above which, however, reduced infectivity while those from P_H 10·6 to 11·2 annulled it completely, the former in four hours and the latter in one minute. In 0·5 mol. mercuric chloride inactivation was complete in one hour.

Johnson (E. M.). **An example of spread of veinbanding from Potatoes to Tobacco.**—*Phytopathology*, xxv, 6, pp. 650–652, 1 diag., 1935.

In 1934 at the Kentucky Agricultural Experiment Station five plots of White Burley tobacco were set the last week in May near two plots of Irish Cobbler potatoes, one planted in the spring and the other in the middle of July. In No. 1 tobacco plot, veinbanding developed in the 90 rows opposite the potatoes to the extent of 53, 36, and 21 per cent., respectively, in the third part of the rows nearest the potatoes, the middle third, and the most distant third [see above, p. 685]. In the remaining 106 rows, not directly opposite the potatoes, the veinbanding percentages for the corresponding thirds were 18, 13, and 10, respectively, while in plot No. 5 they were 35, 18, and 14. Observations were also made on four other tobacco plots at the Station farm, in one of which, containing 414 plants, 60 ft. from potatoes, 66 per cent. of the stand was attacked by veinbanding, while another, 200 ft. from the same potatoes, showed 19 per cent. infection. In two other isolated plots the veinbanding percentages were 7 and 3, respectively, the latter being in that more distant from potatoes.

Dixon (L. F.), McLean (Ruth A.), & Wolf (F. A.). **The initiation of downy mildew of Tobacco in North Carolina in 1934.**—*Phytopathology*, xxv, 6, pp. 628–639, 1 fig., 2 maps, 1935.

Details are given of a study made in North Carolina in 1934 to ascertain the sources of inoculum for primary infections by downy mildew of tobacco [*Peronospora tabacina*: *R.A.M.*, xiv, p. 657].

The fungus overwinters in the State, presumably in the oospore stage, there being no evidence of its survival on plants escaping destruction by cold, or on the seed. Infections were found to develop earlier in seed-beds on sites similarly occupied the previous year than in those on new ground. They occurred, moreover, before the sporangia of the fungus could be trapped in the air in a given locality. The northward progression of the disease may be attributed to seasonal influences modifying the time of occurrence of primary infections in various districts. Primary infections by *P. tabacina* were observed in 35 per cent. of the seed-beds on old tobacco sites, where the fungus was also sporulating 7 to 19 days prior to the appearance of downy mildew in any of the neighbouring beds on new ground. Seed-beds on old sites may therefore be regarded as constituting primary centres of infection, secondary sources being the sporangia conveyed by the air or by human agency. None of the cultural methods practised in North Carolina can be relied upon to destroy all the soil inoculum in seed-beds on old sites, the use of which should therefore be strictly avoided.

Hill (A. V.). **Downy mildew of Tobacco on Tomato, Egg-plant, and Pepper.**—*J. Aust. Inst. agric. Sci.*, i, 2, p. 81, 1935.

When pepper [*Capsicum annuum*] seedlings grown in sterilized soil and protected with cellophane [*R.A.M.*, xiii, p. 694] were inoculated in Queensland with tobacco downy mildew (*Peronospora*) [*tabacina*] they readily became infected and in many cases succumbed [ibid., xiii, p. 191]. Negative results were obtained with tomato and eggplant seedlings and with all these hosts under field conditions. But the

author thinks that tomato and eggplant may be attacked under suitable conditions and regards difference in host range as insufficient ground to justify the specific separation of the American and Australian tobacco downy mildew fungi [ibid., xiv, p. 657].

ANDERSON (P. J.). **Leaf spots [of Tobacco in Connecticut].**—*Bull. Conn. agric. Exp. Sta.* 367, pp. 117–135, 9 figs., 1935. [Abs. in *Exp. Sta. Rec.*, lxxiii, 2, pp. 196–197, 1935.]

An account is given of the symptoms and occurrence of tobacco leaf spots in Connecticut, including those associated with wildfire (*Bacterium tabacum*), angular leaf spot or blackfire (*Bact. angulatum*), ring spot, mosaic (known locally as 'rust' or 'fleck'), and also the apparently physiological disorders known as John Williams broad-leaf spot, and the brown leaf spot and white speck, with both of which *Alternaria tenuis* (*Pleospora alternariae*) [*R.A.M.*, xi, p. 77] appeared to be associated as a saprophyte.

MICHAILOVA (Mme P. V.). **Pathologico-anatomical changes in the Tomato incident to development of woodiness of the fruit.**—*Phytopathology*, xxv, 6, pp. 539–558, 7 figs., 1935.

Full particulars are given of the writer's pathological-anatomical studies on all parts of tomato plants affected by the disorder known as 'woodiness' or 'stowboor' ['stolbur'] in the Crimea [*R.A.M.*, xiv, p. 130], and on the flowers and peduncles of *Convolvulus arvensis* suffering from a similar disturbance.

The following features, amongst others already described [cf. ibid., xiv, p. 128], were observed to be characteristic of the disease in tomatoes: precocious development of the stalks as compared with those of healthy plants, and of the interfascicular wood and ring of bast; hypertrophy of the tissues of the aerial organs, especially in the inner phloem; abnormally early disappearance of starch from the fruits; virtual absence of intercellular passages in the leaf and petal mesophyll; excessive development of the peduncle and pedicel; pollen sterility; and intensification of lignification in the fibrovascular bundles of the poorly-coloured, insipid fruits. Analogous changes were observed in *C. arvensis*.

SMITH (K. M.). **A new virus disease of Tomatoes.**—*Nature, Lond.*, cxxxv, 3422, p. 908, 2 figs., 1935.

Tomato leaves inoculated with a virus recently isolated at the Potato Virus Research Station, Cambridge, from diseased material of the same host received from L. Ogilvie, developed in five days a marked chlorosis with concentric yellow, purple, or necrotic spots. The youngest leaves next showed a tendency to twist and turn pale yellow. A gross lesion then appeared on the stem, at and just below soil level, mostly in younger plants, which subsequently wilted and collapsed.

The virus under observation has been differentiated from all the known viruses affecting tomatoes in the British Isles by ultra-filtration and immunity studies, by its physical properties, and especially by its manifestations on differential hosts. The unusual reaction produced on

cowpea is stated to be alone sufficient to distinguish the new virus from others of the tomato streak group [*R.A.M.*, xiv, p. 261].

OGILVIE (L.). **Spotted wilt of Tomatoes and its control.**—*Rep. agric. hort. Res. Sta. Bristol, 1934*, pp. 170–174, 2 pl., [1935].

Investigations at Long Ashton into the host range of the tomato spotted wilt virus [*R.A.M.*, xiv, pp. 201, 662] showed that the disease is uncommon in glasshouses entirely given over to tomatoes. On several occasions severe outbreaks occurred in houses where arum lilies (*Richardia africana*) [*Zantedeschia aethiopica*] showed a marked spotting of the leaves, stems, and flowers that was ascertained to be due to spotted wilt, this being the first record of the disease on a monocotyledonous host [ibid., xiv, p. 367], and of particular importance as arum lily is a favourite breeding place of the insect vector of the disease, *Thrips tabaci*. Experience has shown that in houses where only tomatoes or tomatoes and arum lilies are grown control is possible by means of frequent roguing and insect extermination.

A list is given of the host plants, belonging to 14 families and over 40 species, on which spotted wilt has been recorded in England [ibid., xiii, pp. 133, 333].

HÜTTIG (W.). **Die Sexualität bei Glomerella lycopersici Krüger und ihre Vererbung.** [Sexuality in *Glomerella lycopersici* Krüger and its inheritance.]—*Biol. Zbl.*, lv, 1–2, pp. 75–83, 5 figs., 1935.

Details are given of the writer's hybridization studies on *Glomerella lycopersici* Krüger [*R.A.M.*, xi, p. 478], the agent of a tomato disease in Germany, the inheritance of sexual reactions in which was found to be governed by three factors, all located in the same chromosome.

HIKSCH (F.). **Beitrag zur forstlichen Schädenfrage der arsenigen Säure im weissen Hüttenrauch der Arsenikhüttenwerke.** [A contribution to the problem of silvicultural damage from the arsenious acid in the white smelter smoke of the arsenic foundry plant.]—*Tharandt. forstl. Jb.*, lxxxv, 3, pp. 117–166, 3 figs., 1934. [Abs. in *Biol. Abstr.*, ix, 5, p. 1001, 1935.]

A summary is given of the results of a century of research on arsenic damage in German forests, with a description of the effects produced by the fumes from the large arsenic plant near Reichenstein, Silesia [cf. *R.A.M.*, xii, p. 524]. The injury extends for 2 to 3 km. in the direction of the prevailing wind and is more severe on the outer fringes than inside the stands. Among hardwoods ash is the most susceptible, followed in the order named by beech, birch, oak, and poplar, the corresponding sequence for conifers being spruce, fir, Scotch pine [*Pinus sylvestris*], white pine [*P. strobus*], Douglas fir [*Pseudotsuga taxifolia*], and larch. The toxic effect of the fumes assumes the form of a browning or burning of the foliage.

LAMB (H.), WRIGHT (E.), & DAVIDSON (R. W.). **A root rot of Chinese Elms.**—*Phytopathology*, xxv, 6, pp. 652–654, 1 fig., 1935.

Nursery stock of Chinese elms (*Ulmus pumila* L. and *U. parvifolia* Jacq.) in the Great Plains region of the United States has been found to

suffer from a serious root rot caused by *Chalaropsis thielavioides* [*R.A.M.*, xiv, p. 408]. Infection probably originates in the seed-bed and may spread rapidly in storage or during transit. The first visible symptom is a greyish-white, mould-like growth over injuries or cracks on the roots, the outer tissues of which turn dark brown to black and break down into a slimy mass as the rot progresses.

The typical micro- and macroconidia of the fungus develop in profusion both in nature and in culture, the former being hyaline to light brown, cylindrical, and borne on long, hyaline or light brown conidiophores, while the latter are dark, broadly ovoid to spherical, and borne on short, hyaline conidiophores. Both types of conidia are very similar to those of *Ceratostomella fimbriata*, but no perfect stage has yet been found for the elm fungus.

Inoculation experiments with *Chalaropsis thielavioides* on *U. pumila* gave positive results. The fungus appears to overwinter in the soil, so that the disease may probably be combated by the establishment of new seed-beds or the sterilization of old ones with steam or formaldehyde, supplemented by a chemical dip treatment of the cuttings.

SIBILIA (C.). **Saggi sulla resistenza di alcuni Olmi asiatici a 'Ceratostomella ulmi' Buis.** [Experiments on the resistance of certain Asiatic Elms to *Ceratostomella ulmi* Buis.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 1, pp. 116–121, 1935.

After stating that *Ulmus pumila* and *U. pumila pinnato-ramosa* have so far shown no sign of infection by *Ceratostomella ulmi* (renamed by Melin and Nannfeldt *Ophiostoma ulmi*) [*R.A.M.*, xiv, p. 274] in Italy, where they have recently been widely planted [ibid., xiii, p. 481; xiv, p. 665], the author describes a series of inoculation experiments with the fungus on the following grafted Asiatic species and varieties of elm, viz., *U. japonica*, *U. elliptica*, *U. laciniata* var. *nikkoensis*, and *U. 'karagatch'* (possibly *U. pumila arborea*); external symptoms of infection appeared on all except *U. elliptica* one month after inoculation, this result confirming those obtained with the same hosts in Holland [ibid., xiii, p. 664]. Histological examination of the inoculated branches (from all of which the organism was reisolated) showed an average advance of 19 cm. in *U. laciniata* var. *nikkoense*, 14 cm. in *U. karagatch*, and 11 cm. in *U. japonica*. It is evident that the virulence of the Italian strains of *C. ulmi* approximates closely to that of the Dutch strains.

GRAVATT (G. F.), MAHONEY (A. E.), & STOUT (G. L.). **Chestnut blight in California.**—*Mon. Bull. Calif. Dep. Agric.*, xxiv, 4–5–6, pp. 173–191, 9 figs., 1935.

In the first part of this paper Gravatt states that chestnut blight (*Endothia parasitica*) [*R.A.M.*, xiv, p. 611] was recorded for the first time in Oregon in 1929 [ibid., ix, p. 352] on two trees which were cut and burnt; the disease did not apparently spread further, but in September, 1934, the fungus was found to be still active on the stump of one of the two infected trees, about a foot below the ground, and measures were taken to eradicate and destroy this stump. Mention is also made of the finding previously to 1932 of an infection with blight of a European chestnut at Agassiz, British Columbia, followed by the

cutting down of a number of unhealthy trees; in 1934, however, an infected tree (since destroyed) was again found in the locality by the author. In October of the same year, he discovered a single infected tree in an orchard near Stockton, California, following which an official survey was undertaken of the chestnut trees in the San Joaquin County, which resulted in the finding of 43 blight-infected trees in another orchard. Field observations suggest that the disease had been present in this orchard for a minimum of eight years. In a brief, popular account of the disease, it is stated that the blight appeared to be more virulent on the European chestnut at Stockton than in the eastern United States, as the cankers did not seem to be checked in their development by the formation of callus tissue at the margins. A disturbing feature of the outbreak was the fact that two Japanese walnut [*Castanea crenata*: ibid., xiv, p. 611] trees were found to have been killed by the fungus, though a third tree was showing resistance.

In the second part Mahoney describes the procedure used by him in the eradication of the disease in the infected areas, and in the third part Stout gives details of the survey which was made in October, 1934, throughout California, and failed to discover any further cases.

GOIDÀNICH (G.). **Coloration du bois de Pin produite par une variété de Sphaeropsis ellisii Sacc.** [Discoloration of Pine wood produced by a variety of *Sphaeropsis ellisii* Sacc.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 5, pp. 181–184, 1935.

A strong dark green to black discoloration of old trunks of *Pinus pinea* stacked in a timber-yard in Rome, and of standing trees of the same species in a neighbouring grove, was caused by a variety of *Sphaeropsis ellisii* Sacc. which the author names *S. ellisii* var. *chromogena* G. Goid. var. n. In many instances infection of the living trees, which was very extensive (the fungus evidently doing much greater damage than any of the other staining organisms isolated, some of which are considered highly dangerous outside Italy), had been favoured by removal of part of the roots during the box planting which is practised in the plantations examined by the author. Entry occurred at the site of galleries made by the bark beetle *Myelophilus piniperda*. The mycelium was found almost exclusively in the medullary rays. In the author's opinion, his observations support the view that staining fungi are capable of killing living trees.

Fructification was observed in nature, but in culture was obtained only with difficulty, though it occurred abundantly during inoculation tests (which rapidly gave positive results) on paraffined blocks.

HUBERT (E. E.). **Some agencies attacking blister rust on White Pine.**—*J. For.*, xxxiii, 6, pp. 603–606, 1 fig., 1935.

Notes are given on the parasitization of the white pine [*Pinus strobus*] blister rust [*Cronartium ribicola*] in the United States by certain biological agents, including the purple mould (*Tuberculina maxima*) [*R.A.M.*, xiv, p. 482] and various insects and rodents. Owing to the slow progress and erratic incidence of these natural factors they are scarcely likely to supersede the control methods of proved utility over

the vast areas to be covered, but it is thought that further studies should be made on their individual and combined possibilities.

Hubert (E. E.). **A disease of conifers caused by Stereum sanguinolentum.**—*J. For.*, xxxiii, 5, pp. 485–489, 1 fig., 1935.

In the spring of 1930 about 90 of the 18- to 20-year-old Douglas fir (*Pseudotsuga taxifolia*) trees in a dense pure stand near Moscow, Idaho, showed evident signs of disturbance rapidly followed by death. Later a number of true firs (*Abies grandis*), spruce (*Picea excelsa*), white pines (*Pinus strobus* and *P. monticola* [western]), and 50 larch (*Larix europaea*) all growing in pure stands, were found to be similarly affected. *Stereum sanguinolentum* [*R.A.M.*, xiv, p. 663] was isolated from the diseased material and grown in pure culture on malt agar.

The symptoms produced by the fungus are fully described. The external features of the so-called 'mottled bark' disease are few and inconspicuous, being most noticeable on Douglas firs in the shape of whitish streaks near the base of the trunk. Resin exudation from the lower part of the trunk and root collar is a common symptom in Douglas firs, spruces, true firs, and to a lesser extent in the white pines. The flat, leathery sporophores are greyish, hairy, and zonate on the dorsal surface and smooth and tan to brownish- or purplish-black on the hymenial one. The bark covering the infected roots, crown, and base of the trunk parts readily from the sapwood, showing a white mottling of its inner surface. The spots vary in shape and size from small, lens-shaped areas suggestive of a pocket rot to larger, confluent patches and streaks; in the later stages the incipient pockets actually develop into hollows, a feature stated to be common to all rots induced by *S.* spp. The underlying sapwood shows a pale to dark greyish-brown discoloration and becomes abnormally soft and spongy. In the descriptions from Canada given by Faull and Miss Mounce [ibid., iii, p. 749] and by McCallum [ibid., v, p. 527], the discoloration is stated to occur in the centre of the heartwood whence it spreads outward towards the sapwood, whereas in the Idaho material the position is exactly reversed. In the former case the symptoms point to the entry of a heart-rotting saprophyte through dead branches or other injuries, whereas in the latter the fungus obviously occurs in a parasitic or semi-parasitic form, attacking the living tissues of a weakened or badly damaged tree and spreading from the bark to the sapwood and ultimately to the heartwood.

A brief discussion is given on the damage caused by *S. sanguinolentum* (involving a 50 per cent. loss within three years in the Douglas firs), and on the measures, based on general silvicultural principles in the absence of more exact knowledge, likely to aid in its control.

Roth (C.). **Untersuchungen über den Wurzelbrand der Fichte.** [Studies on the root scorch of the Spruce.]—*Schweiz. Z. Forstw.*, lxxxvi, 6, pp. 196–208, 1935.

This is an abbreviated account of the writer's work on root scorch (damping-off) of spruce (*Picea excelsa*) in Switzerland, associated with *Fusarium* spp. [including *F. bulbigenum* var. *blasticola* and *Gibberella moniliformis* (*F. moniliforme*)], *Pythium de Baryanum*, and *Corticium*

vagum, the full report of which has already been noticed from another source [*R.A.M.*, xiv, p. 482].

STEINER (H.). **Eine neue Krankheit der Douglasien in Oesterreich.** [A new disease of Douglas Firs in Austria.]—*Wien. allg. Forst- u. Jagdztg*, lii, 25, pp. 113–114, 1935.

Adelopus (?) *balsamicola*, previously recorded from Switzerland and Germany [*R.A.M.*, x, p. 634], has been found attacking 20-year-old green Douglas firs [*Pseudotsuga taxifolia* var. *viridis*] in one locality in Austria. A brief note is given on the symptoms of the disease, which involves almost complete loss of needles, and on the very imperfectly known life-history of the causal organism.

DAVIDSON (R. W.). **Fungi causing stain in logs and lumber in the southern States, including five new species.**—*J. agric. Res.*, l, 10, pp. 789–807, 4 figs., 1935.

The author [who does not cite Melin's and Nannfeldt's paper on the subject: *R.A.M.*, xiv, p. 274] gives details of his investigations in 1931 and 1932, the results of which showed that most of the forest and saw-mill-yard blue staining of felled timber in the southern United States is caused by species of the Ceratostomataceae, among which *Ceratostomella ips* and *C. pilifera sensu* Hedgcock were the most frequently isolated from pine, and *Endoconidiophora coerulescens*, *E. moniliformis*, and *C. pluriannulata* from hardwoods. Latin and English diagnoses are given of two species of *Ceratostomella* considered to be new to science, namely, *C. multiannulata* (common on pine timber but apparently causing little interior discoloration), and *C. obscura* which was obtained only twice from stained pine logs. The genus *Endoconidiophora* is retained for those species of *Ceratostomella* which have endoconidia, and *C. adiposum* and *C. paradoxa* are transferred to it under the new binomials *E. adiposa* and *E. paradoxa*. Isolations from stained timber also yielded a number of Fungi Imperfecti, among which *Diplodia natalensis* [cf. ibid., xiii, p. 763] and *Graphium rigidum* [ibid., xiii, p. 555] alone appeared to be of importance. Three of the species isolated are described as new [with Latin and English diagnoses], namely, *Cadophora brunnescens*, *C. repens*, and *Leptographium microsporum*; they are not apparently of much importance as wood-stainers.

LEVÓN (M.). **Prevention of timber discoloration. Results of chemical dipping methods.**—*Finsk PappTidskr.*, *1935*, pp. 256–262, 1935. (Special issue in English.) [Abs. in *Chem. Abstr.*, xxix, 13, p. 4542, 1935.]

In order to prevent the development of the fungi responsible for blueing of timber in Finland [*R.A.M.*, xii, p. 257; xiv, p. 545], the moisture content of the wood should not exceed 24 per cent. and it should be kept at a temperature just above 0° C. Most of the discoloration develops during the drying process and experiments were conducted to determine the value of certain dipping methods in control. The best results were obtained with lignasan (ethyl mercury chloride) [ibid., xiii, p. 556; xiv, p. 612] and 0·4 to 0·8 per cent. 'dowicide' (chlorinated phenols) in aqueous solutions.

WITKOWSKI (N.). **Über die höheren Pilze der Umgegend von Tartu.** [On the higher fungi of the Tartu district.]—*Arch. Naturk. Eestis*, II Ser., xv, 3–4, pp. 113–180, 1 map, 1934.

An annotated list is given of some 520 higher fungi occurring in the neighbourhood of Dorpat, Esthonia, including a number of well-known wood-destroying organisms.

VARADHAN (C.) & RAO (K. A. N.). **Preservation of wood. Part I. Treatment with creosote-water emulsion.**—*J. Indian Inst. Sci.*, xviii A, 8, pp. 49–59, 1935.

A stable 50 per cent. emulsion of coal-tar creosote in water suitable for wood impregnation has been prepared at Bangalore, using as a stabilizer 0·5 to 1 per cent. nekal A.E.M. (a mixture of 80 per cent. finely powdered glue and 20 per cent. nekal BX, a sulphonated naphthalene derivative, supplied by I.G. Farbenindustrie A.G.). Laboratory and semi-commercial impregnation experiments [the data from which are tabulated and discussed] conducted with this emulsion on a number of well-known Indian timbers, including *Dipterocarpus indicus*, *Terminalia paniculata*, *T. tomentosa*, *Dillenia pentagyna*, *Lagerstroemia lanceolata*, and *Mimusops elengi* showed that the mixture is absorbed in large quantities. Treated samples have further resisted insect and fungus attacks during two years' exposure.

OGILVIE (L.), MULLIGAN (B. O.), & BRIAN (P. W.). **Progress report on vegetable diseases. VI.**—*Rep. agric. hort. Res. Sta. Bristol, 1934*, pp. 175–190, 2 pl., [1935].

This report, which is on the same lines as those for previous years [*R.A.M.*, xiii, p. 667], contains *inter alia* the following items of phytopathological interest. The form of *Rhizoctonia crocorum* [*Helicobasidium purpureum*: loc. cit.] found on asparagus in the Evesham district can attack carrots, garden beets, sugar beets, mangolds, parsnips, and potatoes. In further pot experiments with nine species of *Fusarium* isolated from dwarf beans (*Phaseolus vulgaris*) affected with foot rot [ibid., xiii, p. 668] several of the fungi were found to be pathogenic, but none was so severely or consistently virulent as *F. solani* var. *martii*. The flageolet St. Andrew dwarf bean variety showed satisfactory resistance. Celery soft rot was widespread and destructive; it appears to be probable that in all the cases observed the bacteria associated with the condition were *Bacillus carotovorus* [cf. ibid., vii, p. 218; x, p. 125]. The species of *Botrytis* causing dying-off of winter lettuces growing in the open [ibid., xiii, pp. 139, 669] are being critically investigated; the Lees Immense (various strains), Arctic King, Imperial, and Yate's Winter White varieties again showed satisfactory resistance, with over 70 per cent. survivals through the winter. Mosaic disease of lettuce [ibid., xiii, p. 668] was present to an alarming extent; of 700 plants from mosaic seed 37 per cent. became affected, the corresponding figure for similar commercial seed being 11 per cent. Preliminary experiments indicated that *Macrosiphum sonchi* may be implicated in the transmission of the disease. Pot and field inoculations with the *Fusarium* species isolated from pea foot rots [ibid., xiii, p. 669] showed

that all the most virulent isolations belonged to *F. solani* var. *martii* f. 2 (syn. *F. martii* var. *pisi*) [ibid., xiv, p. 613].

Hoggan (Ismé A.) & Johnson (J.). **A virus of crucifers and other hosts.**—*Phytopathology*, xxv, 6, pp. 640–644, 2 figs., 1935.

Reference has been made at various times to crucifer mosaic in widely separated regions of the United States [*R.A.M.*, vi, p. 214; ix, p. 572; xii, p. 546] as well as in Europe [ibid., xiii, pp. 151, 211; xiv, p. 669, and next abstract]. In 1933 the writers' attention was called to a conspicuous mottling of turnip leaves in a cool greenhouse at 60° F. From two of the diseased plants a virus was isolated that proved to be infectious to a number of crucifers and other hosts; it was transmissible mechanically by means of the juice and more readily by the aphids *Myzus persicae* and *Brevicoryne brassicae*. At 70° to 80° cabbage showed a mild foliar mottling, and mustard and rape severe necrosis and yellowing, followed, in the event of survival of the plants, by distinct mosaic symptoms, sometimes accompanied by savoying of the laminae. Horse-radish leaves and root-cuttings received from Illinois were found to contain a similar virus. Plants grown from the infected root-cuttings showed well-defined vein-clearing and mottling of the leaves.

More striking symptoms were induced by inoculation with the crucifer virus on Connecticut Havana No. 38 tobacco plants, which developed prominent brown, necrotic local lesions, up to 5 mm. in diameter, at the sites of infection on the leaves. Similar local lesions developed also on the hybrid, *Nicotiana tabacum*×*N. glutinosa*, though the latter showed only mild chlorotic spots, with occasional faintly necrotic rings. Mild symptoms were further produced on the red currant tomato (*Lycopersicum pimpinellifolium*), while Bloomsdale spinach contracted systemic infection, manifested by well-defined mottling. The necrotic local lesions on tobacco are of special interest in view of their possible occurrence in the field, where plants growing near crucifers might readily contract this form of mosaic through the agency of aphids.

The thermal death point of the crucifer virus was found to be about 54° C. (ten minutes' exposure), and its tolerance to dilution 1 to 1,000 (1 to 10,000 in one test). Longevity *in vitro* at 20° to 22° usually lay between 24 and 48 hours and was always less than three days under experimental conditions. Non-treated extracts from horse-radish produced considerably more lesions on tobacco than similar material from cabbage. Inclusion bodies were not detected.

Pape (H.). **Über eine Mosaikkrankheit der Kohlrübe.** [On a mosaic disease of the Swede.]—*Dtsch. landw. Pr.*, lxii, 26, pp. 319–320, 4 figs., 1935.

For some two years past observations have been made on a widespread mosaic disease of swedes [cf. preceding abstract] in Schleswig-Holstein, characterized by chlorosis, curling, and premature shedding of the leaves and a dark spotting of the petioles and thicker veins. The petioles are thinner and more numerous than those of normal plants, with a correspondingly larger number of leaf scars (9 to 10 compared with 5 per 7 cm. of collar). The incidence of infection was found to

range from 1 to 90 per cent., the diseased plants occurring singly or more commonly in groups in otherwise healthy stands, especially in the vicinity of quick-set hedges. Early drilling (end of April or beginning of May) appears to favour the mosaic, which attacks with particular severity the Seefelder, Yellow Wilhelmsburger, and Yellow and White Criewener varieties, while Pomeranian Kannen, Yellow Sarling, and White Schmalz are relatively resistant. The losses caused by the disease may be appreciable, the reductions of leaf and root yield amounting in three test plots to as much as 63 and 57 per cent., respectively. Experimental evidence was obtained of the transmission of the disease by *Lygus pratensis* and also by the inoculation of healthy swede leaves with the juice from mosaic foliage.

ANDERSON (M. E.) & WALKER (J. C.). **Histological studies of Wisconsin Ballhead Cabbage in relation to resistance to yellows.**—*J. agric. Res.*, l, 10, pp. 823–836, 2 pl., 2 figs., 1935.

A full account is given of the authors' comparative histological studies of the penetration of the cabbage yellows organism (*Fusarium conglutinans*) into the tissues of a very susceptible strain of Hollander cabbage, of the intermediately resistant Wisconsin Hollander, and of the homozygous resistant Wisconsin Ballhead [*R.A.M.*, xiv, p. 485]. The results showed that all three types are readily entered through the root tip and through the cortex of the young root and hypocotyl, penetration of the cell walls being apparently accomplished by mechanical pressure. Penetration in Wisconsin Ballhead was generally limited to the outer cortical cells or the lower root tip region, and very seldom reached the vascular system, while in Wisconsin Hollander penetration was somewhat more extensive. Suberization of the cortical cells in advance of the fungus was noted only in Wisconsin Ballhead, but suberization of endodermis and pericycle walls often occurred locally in both resistant types when these tissues were approached by the fungus; these reactions, however, were not constant. The investigation is considered to indicate that the basis of resistance in Wisconsin Ballhead differs in degree rather than in kind from that in Wisconsin Hollander, and that it cannot be determined by histological methods.

GIBBS (J. G.). **Control of club-root in Cabbage seed-beds.**—*N.Z. J. Agric.*, l, 5, p. 294, 1935.

This paper on the control of club root [*Plasmodiophora brassicae*] in cabbage seed-beds in New Zealand is a shorter version of one already noticed from another source [*R.A.M.*, xiv, p. 278].

BRANDENBURG (E.). **Physiologische ziekten der Bieten. III. Potproeven en proefvelden ter bestudeering van het hartrot.** [Physiological diseases of Beets. III. Pot tests and trial fields for the study of heart rot.]—*Meded. Inst. Suikerbiet., Bergen-o.-Z.*, 4, pp. 81–91, 2 figs., 1935. [French summary.]

In tests on beet plants in pots filled with quartz or with soil from diseased fields, the application of boric acid at the rate of 30 to 50 mg. per plant completely prevented heart rot [*R.A.M.*, xiv, p. 613 and next abstracts] and greatly increased the sugar content, similar results being

obtained both in Holland and Germany by the use of borax (costing 15 cents per kg.) at the rate of 20 to 25 kg. per hect. The beneficial effects of the treatment were observed to persist during the year after application. Heart rot was found to be prevalent on sandy soils throughout the southern provinces of Holland.

De Haan (K.). **Physiologische ziekten der Bieten. III. Verdere veldproeven voor het onderzoek naar de werking van borax op Suiker- en Voederbieten.** [Physiological diseases of Beets. III. Further field tests in the study of the effect of borax on Sugar and Fodder Beets.]—*Meded. Inst. Suikerbiet., Bergen-o.-Z.*, 4, pp. 92–102, 1935. [French summary.]

The percentages of plants showing heart rot [see preceding and next abstracts] symptoms in plots on a slightly acid, sandy soil at Langendijk, Holland, in 1934, declined from 66 where no treatment was given to 0·1 with borax at the rate of 40 kg. per hect. At 10 kg. per hect. borax increased the sugar yield and sugar content by 34 and 10 per cent., respectively, compared with the control, besides reducing the incidence of heart rot to 2 per cent. The leaf yield was increased 25 and 50 per cent. by 10 and 40 kg. borax, respectively, the corresponding figures for the roots being 22 and 28, respectively. Similar favourable results were obtained in tests on fodder beets, which responded to the application of 20 kg. borax by an increased sugar yield and content of 65 and 16 per cent., respectively, the corresponding figure for dry matter being 58 per cent. In relatively mild cases of heart rot nitrate of soda (1,000 kg. of which was calculated to contain 0·6 kg. borax) was found to exert preventive or curative effects and produce moderate increases of yield. Some indications were obtained at Haarlemmermeer that borax produces a stimulatory or nutritive action in the absence of disease.

Kraus (E.). **Herz- und Trockenfäule der Runkelrüben.** [Heart and dry rot of Beets.]—*Dtsch. landw. Pr.*, lxii, 24, p. 297, 3 figs., 1935.

Very satisfactory results, both as regards yield and freedom from heart and dry rot, are stated to have been obtained in the treatment of beets in a German experiment with powdered borax at the rate of 15 or 30 kg. per hect. [see preceding abstracts]. In one series the yield per plot of 104 sq. m. was increased from 244 to 470·8 and 528·3 kg., respectively, the corresponding figures in the other series per plot of 100 sq. m. being 435·5 kg. for the untreated plot and 458 and 463·5, respectively, for those receiving 15 and 30 kg. borax per hect. This very valuable treatment involves little or no additional labour and its low cost (M. 6 per hect.) is considered to be out of all proportion to the resultant profits.

Wilson (R. D.). **Bacterial blight of Beans. The detection of seed infection.**—*J. Aust. Inst. agric. Sci.*, i, 2, pp. 68–75, 1935.

Isolations made in New South Wales during the past three years from French beans (*Phaseolus vulgaris*) affected with bacterial blight have consistently yielded *Bacterium medicaginis* var. *phaseolicola* [*R.A.M.*, xiv, p. 565] to which most if not all the losses from bacterial blight in the State are attributed. The author describes experiments

which demonstrated that the soaking of affected seed in water before sowing was of value in testing for the presence of the disease; it resulted in an increase in the number of affected seedlings and accelerated the appearance of the symptoms. The detection of severely affected samples was also effected in a few days by soaking some of the seeds in water and inoculating bean pods with the infusion. The optimum period of soaking the seeds appeared to be under 24 hours.

Müller (A. S.). **Doenças do Feijao em Minas Geraes.** [Kidney Bean diseases in Minas Geraes.]—*Bol. Agric. Zootech. Vet. Minas Geraes, 1934*, 7, pp. 384–388, 1934. [Abs. in *Hort. Abstr.*, v, 2, pp. 89–90, 1935.]

The six diseases commonly affecting kidney beans [*Phaseolus vulgaris*] in the State of Minas Geraes, Brazil, are anthracnose (*Colletotrichum lindemuthianum*) [*R.A.M.*, xiii, p. 741]; rust (*Uromyces appendiculatus*) [ibid., xiv, p. 669]; angular spot (*Isariopsis griseola*) [ibid., xiv, p. 87], severe only during protracted dry spells; mildew (*Oidium* sp.), occurring exclusively in abnormally damp seasons; a seed-transmissible mosaic [ibid., xiv, p. 485] which causes yellowing and atrophy on most varieties, though Manteigeo has shown no sign of infection during five years' observation; and *Rhizoctonia* [*Corticium*] *solani* [ibid., xii, pp. 133, 671]. Varieties resistant to the first two of these diseases are available.

Nattrass (R. M.). **Note on Botrytis sp. as the cause of 'chocolate spot' of Vicia faba in Cyprus.**—*Cyprus (agric.) J.*, xxx, 2, pp. 57–58, 1 fig., 1935.

During the very wet spring of 1935 broad beans (*Vicia faba*) in Cyprus were widely attacked by chocolate spot, usually attributed to *Bacillus lathyri*, typical round, oval, or occasionally irregular, frequently confluent lesions, 0·5 to 4 mm. in diameter, developing on the leaves, stems, and petioles; lesions more than 1 mm. in diameter had a brown centre surrounded by a chestnut margin.

From affected material the author isolated a *Botrytis* [see next abstract] which in culture produced a sparse aerial mycelium, conidiophores, and sclerotia measuring 0·5 to 3 by 0·3 to 2 by 0·8 mm. The subglobose to oval, sometimes cuneiform, conidia were 13 to 20 by 9 to 18 μ in diameter and were borne in terminal or intercalary clusters on minute sterigmata at the slightly swollen apices of branched conidiophores.

Inoculations of *V. faba* plants with a conidial suspension of the fungus gave positive results both in the laboratory and the field, the leaves developing typical lesions and sometimes withering in 3 or 4 days. The fungus, which agrees fairly closely with *B. fabae* Sardiña [*R.A.M.*, xiii, p. 741], is a virulent parasite and is considered to be responsible for much of the disease on the island.

Wilson (A. R.). **Relation of Botrytis spp. to the 'chocolate spot' disease of Beans (Vicia faba).**—*Nature, Lond.*, cxxxvi, 3432, p. 226, 1935.

Work has been in progress at Cambridge since 1931 on different aspects of the destructive 'chocolate spot' disease of broad beans, the bulk of which has been found to be due in Britain to several forms of

Botrytis [see preceding abstract]. A full report on these investigations will be published at a later date.

In the field the disease may assume two forms: (1) a lethal attack ending in the blackening and death of a part or the whole of the shoot system, and (2) relatively mild infection expressed by 'chocolate spot' symptoms. Both types of the disease have been reproduced by artificial inoculations in field plots.

Goto (K.). **Onion rusts of Japan. II. Biometrical studies on uredio- and teliospores.**—*J. Soc. trop. Agric. Taiwan*, vi, pp. 44–53, 1934; vii, pp. 38–47, 1935.

No significant differences were disclosed by the writer's extensive statistical studies [the data obtained in which are tabulated and discussed] between the uredospores of the strains of onion rust (*Puccinia*) [*allii* or *P. porri*: *R.A.M.*, xiii, p. 558] occurring in the north and south of Formosa, Japan, except for a reduction in size (especially length) of those of the southern strains cultured on *Allium cepa*. The northern teleutospores were found to be generally larger, and especially wider, and with a thinner apical epispore, than the southern ones. When cultured at Taihoku, in the southern area, the teleutospores of the northern strains underwent certain modifications, including an increase in width and apical epispore thickness and a reduction in length. The strain on *A. schoenoprasum* was found to differ from those on *A. fistulosum* and *A. bakeri* in its broader and shorter teleutospores with a fairly thick apical epispore, while that on *A. bakeri* was distinguishable from the *fistulosum* strains by its shorter teleutospores with a thinner apical epispore, such variations being generally greater than those existing between the northern and southern groups of *fistulosum* strains.

Tempel (W.). **Bekämpft die Fusskrankheit des Spargels.** [Combat the foot rot of Asparagus.]—*Ratschl. Haus, Garten, Feld*, x, 6, pp. 81–82, 1935.

Asparagus in Rhenish Hesse is stated to have been attacked at the end of July and beginning of August, 1934, by *Fusarium culmorum* [*R.A.M.*, x, pp. 288, 289], the incidence of infection by which ranged from 1 to 5 per cent. of the crop. The disease is very probably spread by manure containing infected straw as well as by urban refuse with its high proportion of vegetable waste. In addition to the immediate removal and burning of the diseased shoots down to the root collar, it may be advisable in severe cases to treat the soil for a radius of 1 to 2 m. round the site of infection with 0·25 per cent. uspulun.

Statutory Rules and Orders, 1935, No. 578. Destructive Insect and Pest Acts, England. The Importation of Elm Trees and Conifers (Prohibition) (Amendment) Order of 1935. Dated June 18, 1935.—1 p., 1935.

The Importation of Elm Trees and Conifers (Prohibition) Orders of 1933 [against *Ceratostomella ulmi*: *R.A.M.*, xiii, p. 63] and 1935 are hereby amended to permit the importation into England, as from 19th June, 1935, for instructional, scientific, and similar purposes under official authorization of plants of any of the genera mentioned in the Schedule to the first-named (principal) Order.

Order in Council.—No. 1643. Made under (1) The Customs and Excise Regulation Laws, 1879 to (No. 3) 1930. (2) The Diseases of Plants Prevention Law, 1893. (3) The Customs, Excise, and Revenue Law, 1899.—1 p., 1935.

As from 21st June, 1935, every person arriving in Cyprus by sea or air is required, immediately upon landing, to sign a declaration vouching for the absence from his person or personal luggage of living plant material of any kind other than that duly listed and submitted for inspection and examination [cf. *R.A.M.*, xiv, p. 325].

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, vii, 4, p. 37, 1935.

Saxony. As from 15th February, 1935, fruit trees severely attacked by canker [*Nectria galligena*: *R.A.M.*, xiii, p. 584] or other diseases or pests should be cut down where remedial measures are no longer indicated. Witches' brooms on cherry [*Taphrina cerasi*] should be excised [ibid., xiii, p. 544] and, if necessary, the trees are to be removed. The operations herein prescribed should be carried out before 15th March of each year. In the event of non-compliance with these regulations the police may order the work to be done at the defaulter's expense.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, vii, 6, pp. 91–93, 1935.

Prussia (Hanover). An Order of 14th February, 1935, defines the regulations governing co-operative cereal seed-grain disinfection [*R.A.M.*, xiii, p. 89]. Permission in the form of an annual licence costing M.30 for large plants operating by machinery and M.20 for those on a smaller scale with drum apparatus, the renewals M.20 and M.10, respectively, will be granted by the local authorities to properly qualified persons with suitable premises on the understanding that only officially approved plant protectives are used [ibid., xiv, p. 20] at the prescribed concentration. Police inspections of these 'co-operative disinfection premises under official supervision' will be made from time to time to ensure compliance with the rules, any infringement of which involves a fine not exceeding M.150.

East Prussia. A Presidential Decree of 20th December, 1934, prohibits as from 1st April, 1935 or for some districts 1st April, 1936, the cultivation of potato varieties not immune from wart disease [*Synchytrium endobioticum*: *R.A.M.*, xiii, p. 608]. An exception may be made in the case of establishments entered for annual seed certification. Arrangements for the further application of this regulation will be made in due course.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, ix, 6, p. 139, 1935.

Peru. A resolution dated 15th December, 1934, declares sugar-cane in the Lambayeque valley of Peru to be infected by mosaic [*R.A.M.*, xi, p. 225], with the result that the extraction and transport of cane cuttings from this region to mosaic-free territories of the Republic is prohibited.

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RYKER (T. C.). **Fusarium yellows of Celery.**—*Phytopathology*, xxv, 6, pp. 578–600, 4 figs., 3 graphs, 1935.

A full, tabulated account is given of the writer's studies at Wisconsin University on the pathogenicity, environmental relations, and cultural and pathogenic variability of the agent of celery yellows (*Fusarium* sp.) [*R.A.M.*, xiv, p. 498].

The symptoms of the disease were found to be well-marked and to agree with the published descriptions [ibid., i, p. 101; iv, p. 138]. In the greenhouse tests on Golden Self-Blanching and Michigan Golden Self-Blanching two types of chlorosis were differentiated according to the strain of the fungus used. One (produced only by a strain from Green Bay, Wisconsin) appeared as a yellow flecking due to a clearing of the tissue near the veins and to the progressive chlorosis of the small islands of foliar tissue subtended by the veinlets. Three other strains from Waukesha, Wisconsin, and one from Michigan at first caused clearing only near the larger veins, gradually followed by generalized chlorosis. The pathogenicity of the Wisconsin and Michigan strains did not differ essentially, but there were variations in the degree of virulence and in certain cultural characters. On potato-dextrose agar the minimum, optimum, and maximum temperatures for all strains were about 8°, 28°, and 36° C., good growth being made, however, throughout the range from 20° to 32°. The development of the host is favoured by soil temperatures between 18° and 28°, above which there is marked stunting. In the susceptible Golden Self-Blanching variety yellows developed at a soil temperature range of 18° to 32°, the incubation period decreasing proportionately with the increase of temperature up to 28°. The reaction of certain varieties was modified by soil temperature, Michigan Golden Self-Blanching being highly resistant only at 18°, Winter Queen and Curly Leaf Easy-Bleaching up to 26°, while Michigan Golden withstood infection by all the strains throughout the range investigated up to 31°. All inoculated varieties, whether they became diseased or not, revealed the presence of the *Fusarium* in the cortical region of the secondary roots, but only those manifesting yellows symptoms contained it in the vessels of the primary root. The virulence of the disease was less in relatively dry soils (50 per cent. of the water-holding capacity) than in damp ones (70 per cent.).

Okabe (N.). **Bacterial diseases of plants occurring in Taiwan (Formosa). V.**—*J. Soc. trop. Agric. Taiwan*, vii, pp. 57–66, 1935.

Brussels white-leaved chicory (*Cichorium intybus*) in the Taihoku district of Formosa is liable to a soft rot of bacterial origin almost identical in appearance with that due to *Bacillus aroideae* or *B. carotovorus* [*R.A.M.*, xiii, p. 492]. The lesions at first assume the form of water-soaked, warm- to cinnamon-buff streaks on the older petioles at or near soil level. Under humid conditions the streaks rapidly extend upwards to the midribs or leaf veins and turn warm sepia or snuff-brown. Complete rotting of the tissues ensues, followed by collapse of the affected leaves. On the leaf blades the water-soaked, chrysolite-green spots frequently show a sayal-brown centre and one to three yellowish-green concentric rings.

The causal organism, to which the name *Bacterium formosanum* n.sp. is given, is a motile rod with rounded ends and one to eight polar or rarely bipolar flagella, occurring singly, in pairs, or occasionally in short chains, and forming neither spores nor capsules; colonies on beef extract agar round to amoeboid, convex to raised, glistening, smooth, transparent, opalescent, bluish-, later greyish-white, producing a bluish-green fluorescence in bouillon and Uschinski's and Fermi's solutions; gelatine not liquefied; indol and ammonia formed, but no hydrogen sulphide; milk cleared without curd formation; nitrates not reduced; acid without gas from dextrose, galactose, mannose, levulose, mannite, and glycerine; good growth in Cohn's solution with crystal formation; minimum, optimum, and maximum temperatures and death point, 0° to 5°, 28° to 31°, 35° to 36°, and 61° C., respectively; viability in culture media extending up to 200 days.

Positive results were given by inoculation experiments on chicory, lettuce (*Lactuca sativa*, *L. debilis* Benth. et Hook, and *L. dracoglossa* Mak.), cucumber, potato, tomato, tobacco, carrot (roots), cabbage (including *Brassica pekinensis* and *B. chinensis*), turnip, beet, onion (*Allium cepa* and *A. fistulosum*), Oriental radish (*Raphanus acanthiformis* M. Morel), *Chrysanthemum coronarium*, *Calendula officinalis*, and other plants.

Butler (K. D.). **The Cotton root rot fungus, Phymatotrichum omnivorum, parasitic on the Watermelon, Citrullus vulgaris.**—*Phytopathology*, xxv, 6, pp. 559–577, 3 pl., 1 fig., 1935.

Watermelons in commercial plantings in Arizona are stated to have repeatedly been found susceptible to the attacks of the cotton root rot fungus (*Phymatotrichum omnivorum*) [*R.A.M.*, xiii, p. 350]. The fungus has been isolated from the roots of dying watermelon vines, grown in pure culture on potato-dextrose agar, and inoculated under controlled conditions with positive results on Iowa King, Iowa Belle, Pride of Muscatine, and Black-seeded Klondike watermelons and Acala cotton seedlings in the laboratory and field.

The initial invasion of the host tissues is frequently effected by intercellular 'wedging' of several or many hyphae, but single hyphae were also able to enter between two epidermal cells or directly into a cell. The entrance of the fungus in the cases studied was just behind the

root cap, but older roots are also invaded. Penetration of the walls of living cells appears to be accomplished partly by pressure and partly by a softening of the membrane, probably through enzymatic action, at the point of contact. The mycelium in the host tissues is either intra- or intercellular, the latter condition being most in evidence at first.

In pure culture *P. omnivorum* is inhibited or destroyed by the presence of *Trichoderma lignorum* [cf. ibid., xiv, p. 248], the mycelia of the two growing together without any trace of repellent action. After meeting, the growth of *P. omnivorum* ceased almost completely.

CHAZE (J.) & SARAZIN (A.). **Altération des constituants cytoplasmiques provoquée dans le Psalliote par parasitisme.**—[Modification of the cytoplasmic constituents induced by parasitism in *Psalliota.*]—*C.R. Soc. Biol., Paris*, cxix, 23, pp. 843–847, 3 figs., 1935.

The writers' observations on *Psalliota* [*campestris*] in the early stages of attack by *Mycogone perniciosa* [*R.A.M.*, xiv, p. 674], showed that the chief modifications in the hyphae of the former are a pronounced vesiculization of the chondriome elements, the presence of a larger number of crystals, excessive vacuolar fragmentation in the cells in proximity to the hyphae of the parasite, and nuclear multiplication on a large scale, the average number of nuclei in diseased cells ranging from ten to twenty compared with two or more, rarely four, in healthy ones.

Of the phenomena herein described only the last would seem to be an exclusive result of parasitism by *M. perniciosa*.

WARE (W. M.). **Mushroom-growing in the United States.**—*J. Minist. Agric.*, xlii, 2, pp. 113–119, 2 pl., 1935.

The author gives a brief account of the recent developments in the mushroom-growing industry in the United States, nearly three-quarters of which is centralized in the State of Pennsylvania. Some interesting comparisons are made between the practices in use and the results obtained there and in Great Britain [*R.A.M.*, xiv, p. 490]. While most of the fungal diseases of the crop are common to the two countries. *Xylaria vaporaria* [ibid., xiv, p. 346] and *Clitocybe dealbata* [ibid., xii, p. 611] are stated not to have been recorded so far in the United States, while *Pseudobalsamia microspora* [ibid., xii, p. 352] is unknown in England.

HARGREAVES (E.). **Entomological work.**—*Rep. Dep. Agric. S. Leone, 1933*, pp. 12–14, 1935.

It is mentioned in the course of this report that the dark-veined type of groundnut mosaic [one of three forms of the disease commonly confused under the term 'rosette' differentiated by the writer in the 1932 report of entomological work in Sierra Leone: cf. *R.A.M.*, xii, p. 5] is transmissible by *Aphis laburni*, the symptoms appearing after an incubation period of twelve or thirteen days.

VINAS (J.). **Qualités à exiger du sulfure de cuivre comme anticryptogamique.** [Requisite qualities in copper sulphide used as a fungicide.]—*Rev. Vitic., Paris*, lxxxii, 2134, pp. 325–326, 1935.

After referring to the recent papers by Branas and Dulac on the

value of copper sulphide with or without a vanadium salt as catalyser [*R.A.M.*, xiii, p. 714; xiv, p. 674] for the control of certain fungal diseases, e.g., vine mildew [*Plasmopara viticola*], the author states that the oxidizability of cupric sulphide depends much more on the method used in its preparation than on the presence of a catalyser, fineness of division being one of the chief factors in this regard. From the purely practical spraying standpoint it is further stated that finely divided particles of the substance take a very long time to be deposited, while colloidal solutions of the sulphide remain in suspension indefinitely. Contrary to Branas's and Dulac's opinion, he recommends that the prepared substance should be stored in dry powder form rather than in a damp condition, since the latter induces the formation of large crystals of copper sulphate. Vine-growers are recommended at present, only to make small-scale tests of copper sulphide sprays.

NIEMEYER (L.). **Die durch Pseudomonas tumefaciens (E. F. Smith et Townsend) Stevens verursachte Mauke der Weinreben.** [The Vine 'mauke' caused by *Pseudomonas tumefaciens* (E. F. Smith et Townsend) Stevens.]—*Zbl. Bakt.*, Abt. 2, xcii, 4–7, pp. 116–162, 8 figs., 1 diag., 1935.

An exhaustive, tabulated account, supplemented by a six-page bibliography, is given of the writer's studies and observations (mostly in the Moselle, Saar, and Ruwer valleys) on the so-called 'mauke' disease of the vine caused by *Bacterium tumefaciens* [*R.A.M.*, xi, p. 655].

A perusal of the relevant literature showed the first reference to the disorder to have been made by Hörter in 1822 in 'Der rheinländische Weinbau nach theoretisch-praktischen Grundsätzen für denkende Ökonomen.' I. Teil (128 pp., Koblenz). The symptoms as personally observed were found to agree in the main with the numerous descriptions that have been given of the disease, which does not appear, from information supplied by viticultural institutes, to be of appreciable economic importance in Germany. Among the chief contributory factors in the development of 'mauke' were found to be heavy, sticky soils, arrested growth from cold and hail injury, and drastic pruning, accompanied by an injudicious manuring scheme.

From tumours arising spontaneously and by inoculation, 115 strains of *Bact. tumefaciens* were cultured, 30 per cent. of which were capable of reproducing the symptoms, though their virulence was mostly of brief duration. The transmissibility of 'mauke' from vine to vine (by living and dead tissues and implements), from vine to tomato, from tomato to tomato, and from *Ricinus* [*communis*] to tomato was experimentally demonstrated. The importance of arrested growth of the host in the development of infection by *Bact. tumefaciens* was shown in the inoculation tests, in which under these conditions positive results were obtained as long as ten days after wounding. The longest incubation period of the organism in vines, apple seedlings, and *Pelargonium zonale* was nearly a year. The viability of *Bact. tumefaciens* persisted for 127 days in sand and for 54 in Devonian schist [cf. ibid., v, p. 495].

Fifteen vines cultivated on a commercial scale in Germany reacted similarly, as regards size and rapidity of growth of the tumours, to inoculation with very virulent strains of the 'mauke' organism; in tests

with a miscellaneous assortment of strains the infection data were too unequal and irregular to permit of a clear-cut statement respecting resistance and susceptibility. Vigorously growing, well-nourished plants were generally the most susceptible to infection. Conflicting results were given by experiments in the control of the disease, none of the measures so far adopted against which has proved uniformly successful. In general, however, the vines recover spontaneously or may be freed from the excrescences by appropriate pruning.

László (S.). **Újabb adatok a szölö lisztharmatjának áttelelésébez.** [Recent contributions to the overwintering of *Oidium.*]—*Rep. Hung. agric. Exp. Sta.*, xxxvii, 4–6, pp. 235–238, 1934. [German and French summaries.]

The perithecial stage (*Uncinula necator*) [*R.A.M.*, xiii, p. 398] of *Oidium tuckeri* is stated to have been recognized in Hungary since 1893, between which year and 1927, however, it occurred only sporadically on European vines. In the autumn of the latter year the fungus developed in profusion, especially on American varieties and hybrids of Riparia or Rupestris extraction, and the perithecia were detected exclusively in groups of 15 to 45 on the galls formed by *Phylloxera* [*vastatrix*].

Oversigt over Plantesygdomme. 207. Juli 1935. [Survey of plant diseases. 207. July, 1935.]—*St. plantepat. Forsøg, Kbh.*, 11 pp., 2 figs., 1935.

Among other items of interest in this report on the Danish phytopathological situation in July, 1935, are notes of H. R. Hansen on cereal, turnip, and potato diseases. Potato wart (*Synchytrium endobioticum*) was recorded from nine new localities [*R.A.M.*, xiii, pp. 721, 799]. Potato leaves at Tylstrup bore dark spots on both sides caused by *Cercospora concors* [ibid., xiii, p. 288], an occasional, relatively innocuous pathogen of this host.

Jones (G. H.). **Egyptian plant diseases: a summary of research and control.**—*Bull. Minist. Agric. Egypt*, 146, 45 pp., 8 pl., 1935.

In this bulletin the author gives a general review of the investigations into plant diseases and their control carried out by the mycological section of the Egyptian Ministry of Agriculture during the last nine years [cf. *R.A.M.*, v, p. 19]. The first part of the paper consists of notes on the geographical and physical characteristics of Egypt in relation to plant diseases, the most prevalent types of infection found, the lines upon which research has been conducted, the adaptation of control methods to local conditions, and legislation. In the second part the chief diseases occurring in Egypt [ibid., xi, p. 224] are listed under the common names of the hosts, with notes on their distribution, the losses caused by them, and their control. The paper concludes with a list of official publications on plant diseases issued by the Egyptian Ministry of Agriculture.

Nattrass (R. M.). **Annual Report of the Mycologist for the year 1934.**—*Rep. Dir. Agric. Cyprus, 1934*, pp. 45–49, 1935.

During the period under review wheat flag smut (*Urocystis tritici*) [*R.A.M.*, xiv, p. 83] was again general in Cyprus, causing considerable

damage throughout the wheat-growing areas. The two Australian resistant wheat varieties, 'Geeralying' and 'Nawaba' appear, from two seasons' observations, to be well suited to local conditions. A bacterial disease of wheat, probably identical with that caused by *Bacterium* [*Pseudomonas*] *tritici* [ibid., xii, p. 749], was observed in April for the first time; the affected plants showed twisting of the leaves, an exudation of yellow bacterial slime between the glumes and between the stems and sheaths, and produced no grain.

Heavy attacks of potato powdery mildew (*Oidium* sp.), first reported in Cyprus in 1933, occurred in June. An extensive survey failed to reveal the presence of onion smut (*Urocystis cepulae*) [ibid., xiii, p. 473] in Cyprus, though two undetermined species of *Urocystis* occur on wild *Allium*.

Oak trees in the Polis district were heavily attacked by a 'tar spot' identified at the Imperial Mycological Institute as *Trabutia quercina* (Fr. & Rud.) Sacc. & Roum. An undetermined species of *Naemospora* apparently caused the death of large numbers of *Populus nigra* trees; the fungus was also found attacking the walnut, alder, and hazel. *Pistacia* trees were heavily attacked by *Uromyces terebinthi* [ibid., viii, p. 339].

Wastage of Cyprus oranges on arrival at Covent Garden was almost entirely due to species of *Penicillium*; the amount of infection present increased as the season advanced. *Sclerotinia sclerotiorum* caused a rot of lemon fruits and a fungus with dilute brown, 1-septate pycnospores measuring 4 to 10 by 3 to 4 μ caused a twig die-back of the same host; it was identified at the Imperial Mycological Institute as *Diplodia* (*Microdiplodia*) *warburgiana* Reichert. Inoculation experiments on lemon trees in the open with the *Dothiorella* previously isolated from lemons affected with gummosis showed that the fungus is an active parasite, causing severe gummosis and large cankers. Lemon fruits attached to the tree were rapidly rotted by the fungus which worked down the fruit stalk and formed a canker at the junction of the stalk and twig.

Of four strains of cowpea, viz. Brabham, Victor, Iron, and Groit, resistant to *Uromyces vignae* [ibid., xiv, p. 614] introduced from the United States, the first-named gave the largest yield and the most vigorous plants; the last was discarded as too susceptible to attack by nematodes and *Macrophomina phaseoli* [ibid., xi, p. 711].

Van der Goot (P.) **Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1933.** [Diseases and pests of cultivated crops in the Dutch East Indies in 1933.]—*Meded. Inst. PlZiekt., Buitenz.*, 84, vii+79 pp., 1935.

The following are among the many items of interest in this report, prepared on the usual lines [*R.A.M.*, xiv, p. 152]. Citrus scab [*Sporotrichum citri*] on rough lemon, Japanese citron, Cleopatra mandarin, and other varieties in Batavia was reduced to a minimum by regular applications of 1·5 per cent. Bordeaux mixture [ibid., xiv, p. 692]. Heavy damage was caused in citrus groves by *Fusarium* (*Nectria haematococca*), the attacks of which were apparently favoured by the practice of interplanting with kapok [*Eriodendron anfractuosum*].

A species of *Cercospora* causing leaf and stem rot was responsible for

the failure of the *Chrysanthemum coronarium* crop in Priangan, Java, while pyrethrum (*C. cinerariifolium*) was severely injured during the rainy season by *Sclerotium rolfsii*.

In the Japara-Rembang Residency root rot of rice [ibid., xiii, p. 687] was more widespread than in the previous year, occurring over an area of 2,705 as compared with 1,619 hect.; the corresponding figures in Soerabaja were 6,013 as against 5,723 hect. in 1932.

The *Phytophthora* foot rot of pepper [*Piper nigrum*] in the Bengkajang and Singkawang subdivisions of West Borneo again assumed an epidemic form, and was also a source of heavy losses in the south and east of the island [ibid., xiv, p. 152].

Hevea rubber mildew [*Oidium heveae*: ibid., xiv, p. 331] was prevalent in West Java, where treatment on a limited scale has been instituted, but caused relatively little injury in the central regions. The most important bark disease in the Besoeki district is stated to be stripe canker [*P. palmivora*: ibid., xiii, p. 470], susceptibility to which was found to be a specific property of the clones. Mouldy rot [*Ceratostomella fimbriata*] spread very widely in 1933, and a bark canker (foot rot) affected five- to eight-year-old grafted trees at the junction of stock and scion. Infection by the latter was not readily discernible in the early stages, and below the bark decay was generally more advanced than the external symptoms suggested. Spontaneous healing took place in some plantations. *Xylaria thwaitesii* [ibid., x, pp. 126, 525] was observed on a number of coffee trees in a Central Java plantation. Top die-back (*Rhizoctonia* sp.) [ibid., xiv, p. 152] was for the first time definitely ascertained to be present in Malang. In Sumatra the disease occurred mainly in Moeara Laboeh, its purely sporadic development in the Ophir plantations being possibly limited by the more intensive tillage. The so-called 'bark-splitting' disease, of undetermined origin, appears to be gradually gaining ground in older plantations.

The P.O.J. 2967 sugar-cane variety appears to be very susceptible to mosaic without, however, suffering from the disease to any extent [ibid., xiii, p. 654]. The fields may be kept practically free from infection by strict attention to the health of the canes at the swarming time of *Aphis maydis*. Pokkah-boeng (*F. moniliforme*) [*Gibberella moniliformis*: ibid., xiv, pp. 153, 709] was favoured by the wet season, especially in West Java, and was also very prevalent in East Cheribon. Leaf scald [*Bacterium albilineans*: ibid., xiii, p. 686] was of restricted extent; P.O.J. 2967 seems to be rather susceptible to this disease also.

Pythium aphanidermatum caused at least as much damage in the Besoeki tobacco seed-beds as *Phytophthora* [*parasitica nicotianae*: ibid., xiv, p. 533]. The *Pythium* stem scorch, which causes such heavy damage in Deli (Sumatra) [ibid., xiii, p. 328] some three weeks after transplanting, has only once been observed at this stage in Besoeki.

Demolon (A.) & Dunez (A.) **Recherches sur le rôle du bactériophage dans la fatigue des Luzernières.** [Investigations on the part played by the bacteriophage in the exhaustion of Lucerne fields.] —*Ann. Agron., Paris,* N.S., v, 1, pp. 89–111, 8 figs., 1935.

The authors give details of laboratory and field experiments at Versailles, the results of which are interpreted to indicate that in many

instances the failure of lucerne fields of some years' standing is in great part due to the destruction of the nodule organism (*Bacillus radicicola*) by its bacteriophage [*R.A.M.*, v, p. 756] the presence of which, throughout the whole layer of soil penetrated by the lucerne roots, was conclusively established. Reinfection of the soil with the nodule organism occurs normally from the surface, but in heavy clay soils it progresses in depth very slowly; this may be remedied by resowing such exhausted soils with lucerne seed artificially inoculated with active cultures of the nodule organism, the isolation and culture of which on artificial media are discussed.

DUFRÉNOY (J.). **La bactériophagie en agronomie tropicale.** [Bacteriophagy in tropical agronomy.]—*Rev. Bot. appl.*, xv, 167, pp. 497–506, 1935.

After referring to the investigations of various workers on the bacteriophage of *Bacterium malvacearum* [*R.A.M.*, xiii, p. 697], *Bact. tabacum* [ibid., xiv, p. 154], *Pseudomonas* [*Bact.*] *tumefaciens* [ibid., xiii, p. 152], and of some other organisms, the author gives a brief account of the methods for its isolation, and also for increasing its virulence to the bacteria. He considers that these studies open up new horizons in the investigation of the causes of many hitherto inexplicable crop failures [see preceding abstract].

ARK (P. A.). **Filtrability of certain plant pathogenic bacteria.**—*Phytopathology*, xxv, 7, pp. 728–729, 1935.

Evidence is briefly presented of the capacity of *Erwinia amylovora* [*Bacillus amylovorus*: *R.A.M.*, xiv, p. 702], cultured in tubes of skimmed milk at 28° C., to traverse Berkefeld V and N and Chamberland L_3 filters after an incubation period of 7 to 36 days. Similar results were obtained with *E.* [*B.*] *carotovorus* [ibid., xiv, pp. 698, 730, and below, p. 807], in the case of which, however, no filterable forms developed where the degree of acidity reached P_H 6·6. Hydrogen-ion concentration of the medium, therefore, may be a limiting factor in this phenomenon. Neither organism produced a filterable stage in bouillon.

THOROLD (C. A.). **Diseases of cereal crops in Kenya Colony.**—*Bull. Dept. Agric. Kenya* 2 of *1935*, 66 pp., 16 pl., 1 fig., 1935.

In this valuable bulletin a concise, semi-popular account is given of the more important bacterial and fungal diseases in Kenya of maize (including streak), wheat, oats, barley, rye, sorghums (*Sorghum* spp.) and bulrush millet (*Pennisetum typhoideum*), together with a brief discussion of control measures. Numerous bibliographical references are appended to the descriptions of the individual diseases.

SPRAGUE (R.). **A preliminary check list of the parasitic fungi of cereals and other grasses in Oregon.**—*Plant Dis. Reptr*, xix, 11, pp. 156–186, 1935. [Mimeographed.]

The immediate purpose of this preliminary list of cereal and other grass pathogens occurring in Oregon is to facilitate ready reference to all known diseases of the crops liable to be used in rotation with

cultivated cereals. In the nomenclature of the grasses, Hitchcock's standardized usage has been followed (*Misc. Publ. U.S. Dept. Agric.*, 200, 1935). Arthur's recent manual [*R.A.M.*, xiii, p. 728] was used in the identification of the rusts, supplemented by Jackson's list of Oregon Uredinales (*Mem. Brooklyn bot. Gdn*, i, p. 198, 1918). The genus *Septoria*, represented on a large number of local hosts, is now being studied by the writer, who prefers to withhold final determinations of most of these species for the time being.

HANNA (W. F.) & POPP (W.). **Experiments on the control of cereal smuts by seed treatment.**—*Sci. Agric.*, xv, 11, pp. 745–753, 1935. [French summary.]

The authors give a brief tabulated account of field trials from 1930 to 1934, inclusive, at Winnipeg, to test the efficacy of 16 seed disinfectants in the control of wheat bunt (*Tilletia levis* and *T. tritici*) [*T. foetens* and *T. caries*], covered smut of barley (*Ustilago hordei*), and covered and loose smuts of oats (*U. levis* [*U. kolleri*] and *U. avenae*). Formalin (1 in 320 as a sprinkle) gave good control of all the five fungi, but under certain conditions it caused seed injury, besides being more difficult to apply than the dust treatments. The copper dusts tested (including copper carbonate, monohydrated copper sulphate, and basic copper chloride) controlled wheat bunt when the seed-grain was not too heavily contaminated with spores, and also gave good results with hull-less oats. Satisfactory control of wheat bunt, barley covered smut, and oats smuts was obtained with new improved ceresan [*R.A.M.*, xiv, pp. 221, 688], containing 5 per cent. ethyl mercury phosphate, and this dust, owing to the light rate at which it is applied (½ oz. per bush.) should not cause clogging of the drills. In a series of experiments, which are not reported in detail in this paper, there was evidence that seed treated with copper and mercury dusts gave a higher percentage of seedling emergence than untreated seed.

VONG-MAY (C.) & CHAN-TSI (W.). **Experiments on the control of cereal smuts by the hot-water treatment.**—*Agric. Sinica*, i, 7, pp. 189–238, 3 pl., 1 fig., 4 graphs, 2 diags., 1935. [Chinese, with English summary.]

A study since 1933 in China of the hot-water treatment against cereal smuts showed that barley covered smut (*Ustilago hordei*) and wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] can be entirely controlled by treatment with water at a temperature not below 57° C. for a period of not less than five minutes. Loose smut of barley [*U. nuda*] was not eradicated by treatment of the seed for 30 minutes at 56° or 3 minutes at 60°, but was easily controlled by a modified form of the treatment, comprising presoaking in cold water for 3 minutes and transferring to water at 50° for 5 minutes (3–50–5 formula). Loose smut of wheat [*U. tritici*] was prevented only by the modified treatment; there was no significant difference between the amount of infection in the untreated controls and that in plots where the seed had been treated for 1 to 30 minutes at 52° to 60°. The data obtained showed that in the modified treatment, as the temperature of the water was raised, so the presoaking and immersion periods could be reduced, and

vice versa, treatments with the formulae 3–58–5, 6–54–5, 8–52–5, 3–56–10, and 6–52–10 all preventing infection. The formulae 3–56–5, 3–52–10, 6–52–10, and 24–50–5 controlled the strain on Wutsin-Awnless wheat grown in Nanking, but not that on Lungtsin from Hangchow, which required more intensified treatments.

The germination capacity of wheat seed was not impaired by direct immersion in water at a temperature below 54° for a period not exceeding 20 minutes, or below 60° for a period not over 7 minutes. With some wheats, such as Wuchang 136 and Nanhsuchow, and some barleys, such as Tuchang and Hsiapu, germination was unaffected or slightly increased by the modified treatments, while with others, such as C.U. Quality and Wutsin-Awnless wheats and C.U. 158 and C.U. 103 barleys, germination was markedly reduced.

STELZNER (G.). **Einfacher Nachweis von Hyphen parasitärer Pilze im Halm der Gramineen.** [A simple method of detecting parasitic fungous hyphae in the haulms of Gramineae.]—*Phytopath. Z.*, viii, 4, pp. 369–372, 5 figs., 1935.

Details are given of a method for the examination of the haulms of Gramineae infected by parasitic fungi. The stalks should be cut about 4 cm. above and 1 to 2 cm. below the node, split into two or three longitudinal sections, thoroughly washed, fixed in absolute alcohol, stained either with cotton blue or (for specifically cytological purposes) haematoxylin, and thin sections of the parenchyma tissue transferred to glycerined slides.

Brief descriptions are given of the mycelia of *Helminthosporium gramineum* [*R.A.M.*, xiv, p. 27] and certain cereal smuts in the tissues of their hosts. In the case of *Ustilago avenae* on oats gemmae, as observed by Arland in the flowers [ibid., iv, p. 158], were detected in the haulm. This technique has further been found suitable for the study of latent infection in the Gramineae [ibid., xii, p. 209].

FISCHER (G. W.). **Comparative studies of certain cultures of Puccinia rubigo-vera and Puccinia tomipara on wild grasses.**—*Phytopathology*, xxv, 7, pp. 657–685, 1 fig., 2 diags., 1935.

A comprehensive, tabulated account is given of a series of comparative inoculation experiments at the State College of Washington with nine cultures of *Puccinia rubigo-vera* [*R.A.M.*, xiii, p. 185] from Michigan, Indiana, Ohio, and Kansas and one of *P. tomipara* Trelease (*Trans. Wis. Acad. Sci. Arts Lett.*, vi, p. 106, 1885) from Michigan on 111 collections of species and varieties of wild grasses. The latter is treated by Arthur [*R.A.M.*, xiii, p. 728] as a synonym of *P. rubigo-vera*, whereas Mains [ibid., xii, p. 499] accords it specific rank.

The resultant data showed the nine cultures of *P. rubigo-vera* to be physiologically distinct on the basis of the infection type induced by eight of them on *Agropyron*, *Elymus*, *Hordeum*, and *Hystrix* spp., and one on *Bromus* spp., while some were further differentiated by specialization on their aecidial hosts. For instance, two cultures produced aecidia on *Clematis virginiana*, three on *Impatiens biflora*, one on exotic species of *Thalictrum* (*T. minus*, *T. glaucum*, *T. flavum*, and *T. fendleri*), and one on the two native species of this genus, *T. dioicum* and

T. dasycarpum. *P. tomipara* was successfully inoculated into the above-mentioned species of *Thalictrum* (except *T. minus*), but only three of the 26 species of *Bromus* used in the tests proved highly susceptible to this rust, viz., *B. altissimus*, *B. ciliatus* (on both of which it occurs naturally in the field), and *B. purgans*.

Marked intraspecific reactional differences were observed between various wild-grass collections inoculated with the several cultures of *P. rubigo-vera*, a fact that emphasizes the necessity of using grasses of recognized genetic constitution in experiments of this nature. The degree of specialization presented by *P. rubigo-vera* is stated to be comparable to that characteristic of the races of cereal rusts. Certain cultures were found to differ considerably in spore measurements, especially in their mean uredospore width, the range for the species as a whole being 15 to 23 μ, but modes differed from 17 to 22 μ. The mean teleutospore width also varied, the range being 8 to 21 μ, whereas two cultures had mean diameters of 10·77 and 10·67 μ, respectively. The relative sizes of uredospores and teleutospores were not necessarily correlated and no relationship could be traced between spore size and host specialization.

The multicellular character of the teleutospores of *P. tomipara* remained constant through two generations, thereby establishing, in the writer's opinion, the claim of this rust to specific rank.

HART (HELEN) & FORBES (I. L.). **The effect of light on the initiation of rust infection.**—*Phytopathology*, xxv, 7, pp. 715–725, 1 fig., 1935.

The writers discuss and tabulate the results of controlled experiments at the Minnesota Agricultural Experiment Station to determine the effect of light and darkness on the entry of the uredospore germ-tubes and subsequent development in the hosts of *Puccinia triticina* physiologic form 53, *P. graminis tritici* forms 21 and 49 [ibid., xiv, p. 687] on various wheat varieties, *P. antirrhini* on *Antirrhinum majus* [ibid., xiv, p. 498], *P. coronata* [*P. lolii*] on oats [ibid., xiv, pp. 567, 625], *P. helianthi* on sunflower [ibid., xii, pp. 318, 571], *P. sorghi* [*P. maydis*] on maize [ibid., xiv, p. 438], and *Uromyces appendiculatus* on beans (*Phaseolus vulgaris*) [ibid., xiv, p. 734].

Darkness at the time of inoculation and throughout the early stages of infection was found to diminish the prevalence and intensity of the symptoms induced by *P. graminis tritici* [ibid., xii, p. 498], especially on the susceptible Marquis, and *U. appendiculatus*, but did not affect the course of the disease in the case of *P. triticina* and *P. antirrhini*. The incidence of attack by *P. maydis* and *P. helianthi* was also reduced by darkness, which further slightly modified the severity of the symptoms, though not sufficiently to place the bulk of the plants in the 'light infection' class. The prevalence of infection by *P. lolii* on Gopher oats was not affected by darkness, which did, however, somewhat mitigate the severity of the attack on Victory.

SCHILCHER (E.). **Beitrag zur Rostfrage. (II. Mitteilung.)** [A contribution to the rust problem. (Note II.)]—*Z. PflKrankh.*, xlv, 6–7, pp. 316–335, 4 graphs, 1 map, 1935.

Further studies from 1932 to 1934 on physiologic specialization in

brown rust of wheat (*Puccinia triticina*) in Austria [*R.A.M.*, xiii, p. 83] showed form XIII to be most widely distributed, followed by XV [ibid., xiv, p. 227], whereas XIV, XVI, and XX occurred sporadically and XXI was represented only in one Austrian and one Hungarian collection [ibid., xiii, p. 755]. All the 28 wheat varieties tested for their reaction to the six above-mentioned biotypes of *P. triticina* were more or less severely attacked by the several physiologic forms. Field observations during the period under review showed that the date of onset of *P. triticina* amd *P. glumarum* may vary by as much as one month [cf. ibid., xiv, p. 500] according to the prevailing meteorological conditions, early invasion being mostly followed by heavy attacks, while pustule formation is relatively scanty in the case of late infection. Even ordinarily susceptible varieties may assume an appearance of resistance in years unfavourable to rust development.

BOCKMANN (H.). **Über die Halmbruchkrankheit des Weizens.** [On the straw-breaking disease of Wheat.]—*Dtsch. landw. Pr.*, lxii, 30, p. 369, 1935.

Following up his recent observations on the factors involved in the etiology of lodging of wheat (*Cercosporella herpotrichoides*) in Schleswig-Holstein [*R.A.M.*, xiv, p. 689], the writer seeks to reconcile the apparently conflicting evidence as to the frequent losses from this disease among crops following the admittedly resistant Leguminosae. The explanation apparently lies in the ability of the fungus to persist on stubble refuse from the crop preceding the leguminous one. Care should thus be taken, not only to plough the stubble deeply under the soil immediately after harvesting, but also to avoid bringing it to the surface in the course of the next season's ploughing. Luxuriance of growth in the host is considered to be an important factor in the extent of the damage from this disease.

SIMMONDS (P. M.), RUSSELL (R. C.), & SALLANS (B. J.). **A comparison of different types of root rot of Wheat by means of root excavation studies.**—*Sci. Agric.*, xv, 10, pp. 680–700, 9 figs., 1935. [French summary.]

A tabulated account is given of the authors' comparative studies in 1933 and 1934 at Indian Head, Saskatchewan, of the root systems of healthy wheat (Marquis) plants and of plants affected with common root rot (*Helminthosporium sativum* and *Fusarium* spp.) [*R.A.M.*, xiv, p. 688], take-all (*Ophiobolus graminis*) [ibid., xiv, p. 689], and browning root rot (*Pythium* spp.) [ibid., xi, p. 294]. Common root rot is characterized by brown lesions in the subcoronal internodes and roots of seedlings, which spread by mid-season to the crown and basal leaf sheaths. By the time the healthy plants were nearly mature severe lesions were abundant on the basal parts of diseased plants. Both roots and tops of mature plants are stunted and the yield was only 70 per cent. of the normal.

Take-all causes dark brown or black lesions on the roots and subcoronal internodes of seedlings. The seminal root system is almost completely destroyed by mid-season and is quite dead by the time the crop is ripe. The tops are greatly stunted and almost completely

bleached; the heads were either empty or partially filled with shrunken grain and the yield from diseased plants was only 20 per cent. of that of healthy ones.

Browning destroyed many of the lateral seminal rootlets and many of the crown roots, with the result that most of the leaves died and the seedlings became markedly stunted. Partial recovery followed, due to the continued growth of the seminal roots and of the few crown roots that escaped destruction, but the plants remained greatly stunted and the yield only amounted to 20 per cent. of the normal.

The results of the investigation indicated that the damage caused is approximately proportional to the portion of the root system destroyed, and that the losses from light infections often pass unnoticed, though they are quite considerable in the aggregate. Severe amputation of the seminal root system, whether caused by mechanical means [ibid., xii, p. 501] or by parasitic fungi, tends to reduce the number of tillers and to retard the maturity of the wheat plant, while severe amputation of the crown roots hastens maturity.

Ullstrup (A. J.). **Studies on the variability of pathogenicity and cultural characters of Gibberella saubinetii.**—*J. agric. Res.*, li, 2, pp. 145–162, 6 figs., 2 diags., 1935.

An account is given of the author's studies of the variations occurring under controlled conditions in the pathogenicity and cultural characters of lines of *Gibberella saubinetii* [*R.A.M.*, xiv, p. 720] originally derived from single ascospores isolated [by a method which is described] in sets of eight from the ascospores of a single ascus, or from the tips of the germ-tubes produced by the ascospores; the perithecial material used was collected in 1933 from barley fields in Illinois, Iowa, and Minnesota. The results showed that all the original cultures were strikingly similar in their behaviour irrespective of the locality from which the perithecia had been collected, while considerable variations occurred in the subsequent subcultures, most of which were made from single conidia. The variations were more or less haphazard, and did not appear to be caused by an orderly segregation within the ascus. Subcultures also differed widely in the ability to cause seedling blight of maize, some being highly virulent while others were practically non-pathogenic. The virulent cultures were always characterized by a rapid radial growth and an abundance of aerial mycelium, while the non-virulent cultures grew relatively slowly and exhibited a pionnotes type of growth. No correlation could be established between abundant conidial production and degree of pathogenicity. Passage during one season through the host did not appear to have any influence on the cultural characters of the isolates.

The investigation is considered to suggest that the variability observed may be due either to abnormal nuclear divisions with subsequent reassortment and segregation of a new nuclear complex, or to the existence of true mutants.

Bevilacqua (I.). **La micosi del Grano.** [The Wheat mycosis.]—*Istria agric.*, N.S., xv, 14, pp. 317–319, 1935.

In 1935, wheat growing near Trieste was very severely damaged

owing to infection by *Dilophia graminis* [*R.A.M.*, iv, p. 150; x, p. 75], most of the ears being affected before they had become freed from the leaf sheaths. Control measures comprise cutting the wheat high, burning the stubble, and disinfecting the seed with Caffaro powder.

VILKAITIS (V.). **Apie Rudųju rūdžiu, Puccinia dispersa Erikss., žiemojima.** [The overwintering of brown rust of Rye, *Puccinia dispersa* Erikss.]—Reprinted from *Annu. Acad. Agric. Dotnuva*, ix, 10 pp., 1935. [Lithuanian, with French summary.]

Differences were observed in the extent of brown rust (*Puccinia dispersa*) [*P. secalina*] infection on rye sown at various dates in the autumn of 1934 in Lithuania, the highest incidence occurring among the sowings made on 5th September, slight infection in those made on 6th October, and none in those of 16th October [*R.A.M.*, xiv, p. 689]. Lochows Petkus rye was successfully inoculated in the laboratory with uredospores brought from plants of the same variety in the field up to 20th February, 1935, whereas negative results were given by similar tests in March, at which time it is already becoming difficult to detect the uredospores on outdoor plants. With uredospores collected on 26th December the writer obtained 9·9 per cent. infection on laboratory plants inoculated on 9th April, 104 days later, while small amounts of rust also developed from inoculations made on 30th April and 20th May, 125 and 145 days, respectively, after collection. On the basis of these results the author concludes that *P. secalina* overwinters and probably persists throughout the year in the form of uredospores, although from the beginning of spring up to earing of the rye these spores are difficult to find [ibid., viii, pp. 362, 707, cf. also xiv, p. 499].

DAVIS (G. N.). **Some new aspects of Maize smut.**—*Iowa St. Coll. J. Sci.*, ix, 3, pp. 505–507, 1935.

Inoculations at the spiral whorl of maize plants with a spore suspension of maize smut [*Ustilago zeae*: *R.A.M.*, xiv, p. 436] in various decoctions gave the best results when 1 per cent. fish oil soap-carrot decoction, which had the lowest surface tension, was used (92·3 per cent. infected plants with galls on 69·2 per cent.). Reputedly very resistant plants produced up to 30 per cent. infection when inoculated with spores in this decoction. Many small galls, not large enough to rupture the leaf sheaths, were found at the nodes, indicating that the leaf sheath should be removed when varieties are tested for smut resistance.

Since nodal infections appear late in the season and often in times of drought it was suspected that smut mycelium may lie dormant in the axillary buds for a long period; and evidence is adduced to this effect from a series of experiments during 1931 to 1934, in which inoculated and non-inoculated plants were injured about the middle of August, by the removal (*a*) of the tops, (*b*) of the ears, and (*c*) of the tops and ears. This treatment induced the development of the axillary buds and resulted, in the non-inoculated plants, in increases of 0, 23·3, and 45·1 per cent. nodal smut galls, respectively, over the controls, whilst the inoculated gave increases of 20·4, 15·6, and 31·7 per cent., respectively. Furthermore, histological examination of 262 axillary buds showed 140 to be infected, indicating that a large number of infected buds never

produce smut galls. On the basis of these results the author concludes that the maize smut infects the host at an early stage of development and that stimulation of the axillary buds, which is very marked in dry years, occasions a corresponding development of nodal smut boils as a result of this activity.

McNew (G. L.). **Preliminary studies on the effect of filtrates from cultures of Diplodia zeae upon seedling blight of Maize.**—*Iowa St. Coll. J. Sci.*, ix, 3, pp. 481–487, 1935.

Maize seedlings grown from seed severely infected by *Diplodia zeae* [*R.A.M.*, xiv, p. 437] were found to develop less blight when the seed had been immersed before planting in a cultural filtrate of the pathogen (passed through a Berkefeld 'W' filter) than when it had not been so treated. This result appeared to be independent of the kind of culture media used, but it was necessary for the fungus to have passed the period of active growth before the filtrate became effective. The influence of the filtrate on emergence was pronounced at 16° C., but very slight at higher temperatures. The filtrate did not prevent infection by stimulating abnormally rapid plant growth or by completely preventing fungal growth. The beneficial component in the filtrate being thermostable and non-volatile, it was possible partially to purify it by distilling off the volatile fraction, which was slightly toxic to the plants.

Reddy (C. S.). **Relation of rate of planting to the effect of Corn seed treatment.**—*Iowa St. Coll. J. Sci.*, ix, 3, pp. 527–538, 4 graphs, 1935.

Experiments conducted from 1930 to 1934, inclusive, in Iowa to ascertain the influence exerted by density of stand on the results of seed dust treatment of maize either practically disease-free or moderately infected with *Diplodia* [*zeae*: *R.A.M.*, ix, p. 521], *Gibberella* [*saubinetii*], or *Basisporium* [*Nigrospora* sp.: ibid., xiii, p. 299; xiv, p. 437] demonstrated that artificial thinning by injuring the yield may introduce an uncontrolled factor into seed treatment tests. A study of the relationship of field stands to yields showed that stands and yields are positively correlated up to a certain point, but beyond this point of most production (which varied from 7,000 plants per acre in 1930 to 13,000 in 1931) the higher the stand the lower the yield. Increased yields were recorded as a result of seed dust treatment in stands lower than the most productive, the increased yields being 4·4, 3·3, 2·7, and 1·1 bushels per acre, whereas in stands higher than the most productive the effect of seed treatment was to alter the yield by 2·5, —1·3, 1·9, and —0·7 bushels per acre. These latter figures show two significant increases, while the decreases are not significant, so that the plants from the treated diseased seed were more productive than those from the untreated diseased seed. Seed treatment killed, inhibited, or delayed fungal action, the data strongly indicating that the result of the treatment was not confined to its effects on the stands.

Wellhausen (E. J.). **Genetic investigations of bacterial wilt resistance in Corn as caused by Bacterium stewarti (Smith) Migula.**—*Iowa St. Coll. J. Sci.*, ix, 3, pp. 539–548, 1 pl., 1 diag., 1935.

A study of the inheritance of resistance to bacterial wilt of maize (*Bacterium* [*Aplanobacter*] *stewarti*) [*R.A.M.*, xiv, p. 503 and next

abstracts] made with 56 inbred lines and certain single crosses submitted to artificial wound inoculations showed that most of the field maize inbred lines were resistant, most of those of the Evergreen group were intermediate, and most of the early sweet corn inbred lines were susceptible. Dominance of resistance was found in all the F_1 material tested; in a few cases the F_1 individuals were more resistant than the parents. The results of the back-cross and later generation progenies of the crosses OSF×WF and OSF×W–134 showed definite segregation of factors for resistance with a strong indication that two major dominant complementary genes, with perhaps a third modifying one, were involved.

Histological investigations showed that in very resistant seedlings about 10 per cent. of the bundles became infected shortly after inoculation, whereas after two months only very seldom was such infection seen. Reaction to invasion varied in susceptible lines and certain inbreds showed a modified development of the bundle following infection of the protoxylem, the parenchyma cells around which were replaced by heavily lignified cells radiating in all directions. This condition was not found in the most susceptible W–134, which may partly account for its readiness to wilt after infection.

MAHONEY (C. H.) & MUNCIE (J. H.). **Is resistance to bacterial wilt in Sweet Corn heritable?**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 458–473, 1935.

A tabulated account is given of the writers' experimental studies in Michigan on the inheritance of resistance to bacterial wilt (*Phytomonas* [*Aplanobacter*] *stewarti*) [see preceding and next abstracts], the results of which showed that hybrid varieties tend to be equally susceptible in the field with open-pollinated types of comparable maturity date. Attempts to correlate wilt percentage with maturity, yield, and seedling infection gave negative results, as did also various other genetical investigations. Arising out of the data obtained in 1933–4 is the problem of what constitutes resistance of maize to bacterial wilt in the field, i.e., whether it is a true, inherent resistance or due to tolerance of the organism or merely ability to escape attack under favourable environmental conditions. Both the two last-named types of resistance appear to exist, the incidence of infection among the early varieties in a given season being largely determined by the weather (disease escape), while an innate capacity to withstand the disease ensures the survival of a sufficient number of late-maturing individuals to produce a fair crop (disease tolerance). The only strains in these tests showing really low percentages of infection were markedly vigorous hybrids, of which one parent was an inbred of a cross between Evergreen sweet corn and Reid's yellow dent field maize.

ELLIOTT (CHARLOTTE). **Dissemination of bacterial wilt of Corn.**—*Iowa St. Coll. J. Sci.*, ix, 3, pp. 461–480, 4 pl., 1935.

After referring to the unprecedented severity of the outbreaks of maize bacterial wilt (*Aplanobacter stewarti*) that occurred in the United

States in 1932 and 1933 [*R.A.M.*, xiii, p. 571 and preceding abstracts], the author briefly reviews the history of the disease and states that evidence has been obtained indicating that *A. stewarti* probably overwinters in the flea-beetle (*Chaetocnema pulicaria*), found by Rand to carry the disease to large percentages of maize plants. Isolations from 175 overwintered adult beetles collected in April 1934 showed the wilt organism to be present in 19 per cent. In the summer of 1934 *Euchlaena mexicana* plants growing in the field in Maryland showed natural infection by *A. stewarti*.

MATTHEWS (I.). **The zinc sulphate treatment for mottle leaf of Citrus trees in the Sundays River Valley. Progress report.**—*Citrus Grower, 1935*, 41, pp. 30–32, 1935. [Afrikaans translation.]

The incidence of mottle leaf on Navel and Valencia oranges in the Sundays River Valley, Pretoria, is stated to have been reduced from between 50 and 80 per cent. to a minimum by the zinc sulphate treatment [*R.A.M.*, xiv, p. 628] which has been applied since 1933. The compound may be given either as a soil application at the rate of 8 lb. per tree in a strip of 18 to 24 in. round the trunk, or as a spray consisting of 10 lb. zinc sulphate (23 to 25 per cent. zinc), 5 lb. hydrated lime, ½ lb. spreader, and 100 galls. water.

FINCH (A. H.), ALBERT (D. W.), & KINNISON (A. F.). **Progress on the control of Citrus chlorosis or decline.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 20–23, 1 fig., 1935.

The symptoms of citrus chlorosis in Arizona are briefly described and notes given on experiments in its control by the insertion of ferric citrate through holes in the trunks, soil applications of ferrous sulphate, and other less generally satisfactory methods of applying iron to the trees [*R.A.M.*, xiv, p. 561]. This disorder, which appears to be undoubtedly related in some way to iron metabolism, is stated to affect over twenty different plants in the State. In citrus the first symptoms usually appear at an age of 8 to 12 years and are most conspicuous at 18 to 20.

MENCHIKOWSKY (F.) & PUFFELES (M.). **The ratio of Ca, Mg : K, Na, and the chlorosis of Grapefruit trees in the Jordan Valley.**—Reprinted from *Hadar*, viii, 6, 14 pp., 1935.

Chemical investigations on the chlorosis of grapefruit occurring in plantations at the Agricultural Experiment Station, Jericho, showed that this disease could not be attributed to the chlorine present in the soil or irrigation water, to the absence of iron or magnesium, or the presence of boron in the soil. Abnormally low ratios of K_2O+Na_2O to $CaO+MgO$ were found in the soil of affected plantations (e.g., 0·098 as against 0·128 normally) and in the ash of leaves from affected trees (e.g., 1·519 as against 2·490), and the authors conclude that the disease is the result of disturbed metabolism consequent upon these soil conditions, which furthermore increase the sensitivity of the trees to chlorine.

WAGER (V. A.). **Bleaching Citrus fruits for the removal of the sooty blotch blemish.**—*Citrus Grower, 1935,* 40, pp. 42–46, 1935. [Afrikaans translation.]

Details are given of laboratory experiments in the control of sooty blotch of Navel oranges (*Gloeodes pomigena*) in South Africa [*R.A.M.*, xiii, p. 437], from which it appears that excellent results were obtained with eusol (chloride of lime and boracic acid) at 1 oz. to 1 lb. per gall. of water, the treatment at the two lowest concentrations requiring three and five minutes, respectively, while at the three higher ones it occupied only half a minute. The fruit thus treated was of an even brighter and more attractive appearance than that immersed in chloride of lime alone, though the latter was well up to standard.

BAKER (R. E.). **Citrus fruit-rots in Trinidad.**—*Trop. Agriculture, Trin.*, xii, 6, pp. 145–152, 2 graphs, 1935.

As a result of investigations during the 1934–5 season the author states that rotted grapefruit was hardly ever found on the trees in Trinidad, unless the fruit had been mechanically injured by some external cause. In storage, wastage of grapefruit, apart from that due to chilling or desiccation, was chiefly caused by *Botryodiplodia theobromae* [cf. *R.A.M.*, xiii, p. 456], *Penicillium digitatum* [ibid., xiv, pp. 182, 577], and *Colletotrichum gloeosporioides* [ibid., xiv, p. 183], while rots caused by other fungi, including *Phomopsis* [*Diaporthe*] *citri* [ibid., xiv, p. 182], *Dothiorella* [*Botryosphaeria*] *ribis*, *Penicillium italicum* [loc. cit.], and others, occurred very occasionally. The fact that *Phytophthora parasitica* and *P. palmivora* [ibid., xiv, pp. 506, 692] have never been observed to cause wastage in storage appears to be due to the practical incapacity, established experimentally, of these fungi to develop at the temperatures at which grapefruit is usually stored for shipment (53° F. or less). Besides these several other fungal rots were observed in the packing sheds. A full description is given of the character of the rots caused by the various organisms, as well as a tabulated account of inoculation experiments with them on Marsh grapefruit. *Trichoderma lignorum* [ibid., xiii, p. 775] has not been found causing primary rot of citrus fruits in Trinidad, and all inoculation attempts with it have given negative results.

TOMKINS (R. G.) & DREYER (D. J.). **Brown markings on S.A. Citrus fruits.**—*Citrus Grower, 1935*, 41, pp. 1–4, 33–35, 37–38, 40–42, 44, 46–48, 17 figs., 1935. [Afrikaans translation.]

Oranges and grapefruit from the Eastern Transvaal and East and West Cape are stated to have frequently arrived at the English markets during the 1934–5 season showing various types of brown markings and spotting. Low temperature breakdown, affecting fruit stored at or below 40° F. during the three weeks' voyage from South Africa, assumes the form of definite sunken areas, sometimes surrounded by a more faintly discoloured halo in which the browning is confined to the tissue between the oil cells, suggesting that the disturbance is partly due to the liberation of oil and subsequent damage to the tissues. Grapefruit from Portuguese East Africa, which is 33 days in transit, is

reported to have suffered from this type of injury for several seasons. It has been experimentally shown with 175 cases of Beira grapefruit that the disorder may be obviated by carrying the fruit at 52° F., but it is as yet uncertain to what extent this practice is commercially feasible. The Marsh Seedless variety appears to be the most susceptible to low temperature breakdown, Walters and Foster less so, and Triumph comparatively resistant.

Button browning or incipient stem-end rotting and corky lateral browning associated with *Colletotrichum gloeosporioides* and *Alternaria citri* [*R.A.M.*, xiv, pp. 628, 692] were largely, though not exclusively, found in ethylene-treated fruit [cf. ibid., xiv, p. 578]. In the centre of the fairly soft, leathery spots characteristic of this type of damage, the oil cells had collapsed and the loss of water resulted in a smooth, somewhat silvery aspect. Oleocellosis [ibid., xiv, p. 356] is another common trouble among South African oranges, especially those that have been artificially ripened. Browning is confined to the tissue between the oil cells, the markings being irregular in size and outline but not modifying the contour of the fruit. On the other hand, in the case of injury due to low temperatures in the groves before picking, the brown areas are fairly regular, but the collapse of the cells causes pitting and thus induces a distinct change in the shape of the orange.

All these disturbances are thought to be interrelated and dependent on a number of factors necessitating local investigations before any definite scheme of control can be evolved. Some tentative suggestions, however, are made for improvements in current methods of handling the fruit.

Beckley (V. A.). **Observations on Coffee in Kenya. Pt. I. Chlorosis and die-back in Coffee.**—*Emp. J. exp. Agric.*, iii, 11, pp. 203–209, 2 pl., 1935.

In East Africa coffee plantations are sometimes so severely affected with chlorosis [*R.A.M.*, x, p. 519] as to show up as yellow patches in the general landscape. Four types of the disease are discussed in this paper. The first is ascribed to nitrogen deficiency and is usually accompanied by die-back of the branches, while the roots are unaffected. The loss of crop is severe, but the disease is arrested by the application of nitrogenous manures. The second type, associated with a severe die-back of both branches and roots, is attributed to carbohydrate deficiency caused by overbearing. The two other forms recognized cannot yet be assigned to any definite causes.

Clara (F. M.). **A new disease of Cotton (Gossypium sp.) in the Philippines.**—*Philipp. J. Agric.*, vi, 2, pp. 217–225, 3 pl., 1935.

Since 1932, cotton at the Central Experiment Station, Manila, has been affected by *Bacterium malvacearum* [cf. *R.A.M.*, ii, p. 445], *Glomerella gossypii* [ibid., xiii, p. 804], and *Colletotrichum gossypii* [? *G. gossypii*: ibid., ix, p. 32], as well as by the following diseases not before observed in the Philippines, viz., *Helminthosporium* blight, *Cercospora althaeina* [ibid., xiv, p. 195], club leaf or cyrtosis [ibid., xi, p. 298], and an *Alternaria* leaf disease.

Helminthosporium blight [ibid., v, p. 423] produces circular to very

irregular, zonate, brown spots of various sizes on the leaves, chiefly the lower ones. Infected tissue may fall, producing a shot hole effect, and when severely attacked the leaf may be shed. The bracts and bolls are also involved, and badly infected plants are stunted. During the last two seasons the disease has caused considerable damage, though less in 1934 than in 1933. Infection was very probably introduced on cotton seed brought from abroad.

Inoculations of pot plants with pure cultures of the organism gave positive results on 13 out of 20 plants, the lesions being circular and brownish, but without concentric zonation. The mature, but not the youngest, leaves and bolls readily became infected.

A comparison of the morphological characters of the author's fungus with those of *H. gossypii* reported from Porto Rico [loc. cit.] showed differences in the size of the conidia and the conidiophores, the conidia of the Philippine organism measuring 77 to 164·65 by 12 to 16 (average 115 by 14·3) μ and the conidiophores 81 to 162·8 by 5·5 to 7·4 μ. As, however, the Philippine fungus exhibits considerable variability and is closely similar to the Porto Rican in other characters the author refers it to *H. gossypii*.

Control consists in the selection, careful handling, and disinfection of the seed.

MASSEY (R. E.). **Section of Botany and Plant Pathology, G.A.R.S. Report by Mr. Massey on experimental work carried out by the staff of the section during season 1933–34.**—*Rep. Gezira Agric. Res. Serv., 1934*, pp. 119–141, 1 diag., 1 graph, 1935. [Mimeographed.]

In 1934, the cotton wilt found every year for the last ten years towards the end of October in the Gezira area of the Sudan [*R.A.M.*, xiv, p. 358] was observed on about 9th November. During December it became prevalent all over the Gezira Research Farm, the mortality averaging about 2·5 per cent., but in the worst spots reaching up to 15·3 per cent. Heavy shedding of leaves, buds, and bolls was general throughout the Gezira in November and December, the estimated yield of the crop being halved in two months owing to the loss of unripe bolls, many of which showed no sign of disease. In general, the greatest losses occurred between mid-November and mid-December. The root systems of plants dead or wilting were severely affected and marked destruction of the fine rootlets was usual even in plants not actually wilting. The finest rootlets showed heavy fungal invasion, the most striking feature being the presence in Sakel rootlets of the vesicles of the Phycomycetoid endophytic fungus [ibid., xiv, p. 248]. Other fungi isolated included *Fusarium solani* [ibid., xiii, p. 696], *F. scirpi* var. *caudatum* [ibid., xiii, pp. 128, 593] (a parasite of *Hibiscus esculentus*), *Gibberella moniliformis*, a species probably belonging to section *Elegans* or *Martiella*, a fungus apparently agreeing with *F. falcatum*, *Macrophomina phaseoli* (possibly two strains), and a pycnidial fungus resembling *Ascochyta gossypii*. From the beginning of the investigation in December *Pythium* species were obtained from the blackened stumps of affected rootlets. It was also found that unsterilized extracts of Gezira soils taken from the surface or from a depth of over two feet

produced on cotton seedlings grown therein suppression of root development, browning, and a slimy rot. The disease was also associated with soils having a high alkali content. The evidence as a whole strongly indicates that a group of fungi exert a seasonal attack on the root system, beginning probably at the end of September and extending throughout October and early November. In years of heavy rainfall this preliminary attack, probably due to *Pythium*, is followed by root invasion by other fungi.

For the first time in the Gezira the leaf curl damage from ratoon cotton was largely eliminated by pulling up the crop at the end of the season [ibid., xiii, p. 697]. Although diseased plants could be found in the new crop from 4th October onwards, the disease did not become really noticeable in any part of the Gezira until very late in the season.

Blackarm [*Bacterium malvacearum*: ibid., xiii, p. 765; xiv, p. 358] was present everywhere on the Gezira Research Farm by the end of November, but was really serious only where heavy initial infection had been present. Confirmation was obtained of the view previously expressed [ibid., xiii, p. 696] that the main source of infection of the new crop is adjacent land on which cotton has been grown the season before. A further test on the effect of flooding on destroying *Bact. malvacearum* in plant remains [loc. cit.] showed that plots sown after being spread with infected débris and then flooded for 4 and 2 days averaged, respectively, 2·1 and 2·8 per cent. blackarm, as against 69·5 per cent. for the controls not subjected to flooding. The leaves in the flooded series were only slightly spotted, whereas in the controls the lesions were larger, often running down the veins.

An active bacteriophage [ibid., xiii, p. 697] was again isolated from Blue Nile flood water (September), but all attempts to detect it in Blue or Main Nile water during winter (January onwards) failed. It was found in every sample examined of Gezira soil taken from plots that had recently borne infected cotton and its formation was induced in garden soil by repeated inoculations with a non-lytic culture of *Bact. malvacearum*.

Lavier (G.). **Sur une Nucleophaga parasite d'Entamoeba ranarum.**—[On a species of *Nucleophaga* parasitizing *Entamoeba ranarum*.]—*Ann. Parasit. hum. comp.*, xiii, 4, pp. 351–361, 1 pl., 1 fig., 1935.

An account is given of an apparently undescribed Chytridiaceous parasite of the nucleus of *Entamoeba ranarum* occurring in *Alytes obstetricans* tadpoles from the Côte-d'Or, France, which is named *Nucleophaga ranarum* [without a Latin diagnosis]. After having gained entrance into the host nucleus, the parasite at first appears as a small, greyish, finely granulated body which later divides into a central mass and a ring of peripheral chromatic masses, presumably representing nuclei of the organism; these masses progressively increase in number until the greatly hypertrophied nucleus of the host is filled with them; at this stage the masses are transformed into spores, elliptical rather than spherical in shape and about 2 μ in their longest diameter. No sporangial envelope has so far been seen, and the spores appear to be dispersed with the rupture of the host nucleus.

COUCH (J. N.). **A new saprophytic species of Lagenidium, with notes on other forms.**—*Mycologia*, xxvii, 4, pp. 376–387, 40 figs., 1935.

A detailed description [but no Latin diagnosis] is given of a new species of *Lagenidium*, named by the author *L. giganteum*, which was found in North Carolina weakly parasitic on mosquito larvae, and in Virginia on *Daphne* and copepods. Inside the host insect the fungus forms hyphal segments measuring 50 to 300 by 6 to 40 μ, any one of which may develop into a sporangium. Numerous slender external hyphae extend from the host to a distance of 1 or 2 mm. to form a fringe which has much the appearance of a delicate species of *Aphanomyces*; most of these hyphae are long emergence tubes for the sporangia, the contents of which are emptied as an undifferentiated, naked mass (sometimes several masses). Eventually this mass differentiates into a variable number of monoplanetic, kidney-shaped, laterally biciliate zoospores, 8 to 9 by 9 to 10 μ in diameter. The fungus was cultured on a variety of media, on some of which it formed an extensive mycelium.

Notes are also given on five other species (one doubtful) of this genus.

REDAELLI (P.) & CIFERRI (R.). **A propos de nouveaux synonymes probables de Torulopsis neoformans (Sanf.) Red. 1931.** [Concerning some new probable synonyms of *Torulopsis neoformans* (Sanf.) Red. 1931.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 7, pp. 243–244, 1935.

After referring to Giordano's recent studies on *Torulopsis neoformans* [*R.A.M.*, xiv, p. 694] the authors state that in all probability *Cryptococcus guilliermondi*, *C. kleini*, *C. plimmeri*, and *C. breweri* are also identical with this species, though in the absence of authentic material their opinion is based only on the published descriptions of these organisms. All show more or less viscous, shining colonies, spherical or spheroidal cells surrounded by a mucous capsule, an inability to ferment carbohydrates, and a ready adaptability to different media.

GOMEZ-VEGA (PAULINA). **Mycostatic studies on certain Moniliae and related fungi.**—*Arch. Derm. Syph., Chicago*, xxxii, 1, pp. 49–58, 1935.

Crystal violet and its compounds, gentian and methyl violet [*R.A.M.*, xiv, p. 584], showed marked specific action or selective activity *in vitro* on *Monilia* and *Torula* spp. isolated from human patients at Bogota, Colombia, inhibiting growth at concentrations of 1 in 1,000,000. The first-named has further given promising results in the clinical treatment of monilial paronychia [ibid., xi, p. 714] and of onychia associated with (?) *Trichophyton*. Mercurochrome showed no fungistatic [growth-inhibiting] action in dilutions of 1 in 500, but proved to be a powerful sensitizer to visible light, inhibiting the growth of *M.*, *T.*, *Epidermophyton*, and *Saccharomyces* spp. at 1 in 10,000 after a brief exposure to sunlight. A strong fungicidal action was exerted by cresol, which destroyed the above-mentioned organisms in half a minute at 1 in 250.

WOODWARD (J. G.), KINGERY (L. B.), & WILLIAMS (R. J.). **The fungicidal power of phenol derivatives. II. Strength in the presence of proteins.**—*J. Lab. clin. Med.*, xx, 9, pp. 950–953, 1935.

Three phenol derivatives, viz., n-hexylresorcinol, chlorothymol, and thymol, were compared with iodine, sodium hypochlorite and thiosulphate, salicylic and benzoic acids for their toxicity to *Monilia* [*Candida*] *tropicalis* in the presence of proteins, represented by hide dust, vesicle fluid, and blood serum [*R.A.M.*, xiv, p. 584].

The strong fungicidal action of iodine was greatly reduced in the protein suspensions, the effect of which on n-hexylresorcinol was similar but relatively less powerful; saturated solutions of chlorothymol, benzoic and salicylic acids, and sodium thiosulphate were entirely inactive in the presence of proteins and thymol was toxic only in the hide dust suspension, whereas sodium hypochlorite maintained its killing capacity at high concentrations (1 in 750 in hide dust and 1 in 500 in the two other proteins used).

Preliminary results with some of the higher phenol derivatives suggest possibilities of an extended application for fungicidal purposes.

MERCER (S. T.) & FARBER (G. J.). **An epidemic of ringworm due to Epidermophyton floccosum (inguinale).**—*Arch. Derm. Syph., Chicago*, xxvii, 1, pp. 62–68, 1935.

Details are given of an epidemic of crural ringworm (*Epidermophyton floccosum*) [*R.A.M.*, xiv, p. 510] involving 52 members of the crew of a New York passenger liner. Infection was of exceptional virulence, causing generalized lesions in five men and more or less extensive eruptions in others. On Sabouraud's maltose agar the colonies of the fungus consisted of a flattened cone with an irregularly cupped, eccentric apex and radial folds extending to the fringed borders and a powdery, greenish-yellow surface. Numerous oval or clavate, septate macroconidia (fuseaux) developed singly or in clusters, accompanied in some cultures by chlamydospores.

MAGALHÃES (O. DE). **Ensaios de mycologia.** [Mycological studies.]—*Mem. Inst. Osw. Cruz*, xxx, 1, pp. 1–55, 48 pl. (3 col.), 1935.

A full account is given of the author's studies on the 13 fungi associated with 60 cases of human diseases in Minas Geraes, Brazil. Five fresh cases of *Coccidioides immitis* [*R.A.M.*, xiv, p. 631] were investigated. A 21-year-old female patient suffered from facial lesions due to *Rhinocladium* [*Sporotrichum*] *beurmanni* [ibid., xiv, p. 632]. Kaufmann-Wolf's *Trichophyton* [*Epidermophyton*] and four forms differentiated by Ota are regarded as variants of *T. interdigitale* [*T. mentagrophytes*: ibid., xiv, p. 101 *et passim*], while Kambayashi's *Microsporon japonicum* [ibid., xii, p. 290] would appear to be identical with Ota's *M. ferrugineum* [ibid., xiii, p. 768]. A table is given (pp. 8–35) showing the date of publication, author, citation of the original description, and in some cases synonymy, of 175 ringworm fungi. In conclusion descriptions and extensive observations are given on the morphological, cultural, and pathogenic characters of two new species [figures of which are also included but no Latin diagnoses], viz., *T. gamelleirae* isolated

from Dutch cattle, and *M.* (*Sabouraudites*) *paraferrugineum* from a female infant.

SHAW (R. M.) & MACGREGOR (J. W.). **Maduromycosis : with the report of a case due to Monosporium apiospermum.**—*Canad. med. Ass. J.*, xxxiii, 1, pp. 23–28, 3 figs., 1935.

Following an introductory summary of the history and etiology of maduromycosis a full clinical description is given of a case of this disease, believed to be the first in Canada, in a 42-year-old farmer. The fungus isolated from the left leg was identified as *Monosporium* [*Scedosporium*] *apiospermum* [*R.A.M.*, xiv, p. 637 and next abstract]. Cultural and morphological details of the organism are given.

DOWDING (ELEANOR S.). **Monosporium apiospermum, a fungus causing Madura foot in Canada.**—*Canad. med. Ass. J.*, xxxiii, 1, pp. 28–32, 9 figs., 1935.

Monosporium [*Scedosporium*] *apiospermum*, isolated from a case of maduromycosis in Canada [see preceding abstract], was grown on glucose agar and on Sabouraud's medium with European cultures of the same fungus for comparison. In addition to features previously described [which are summarized], the following observations were made. The cultures darken from white to cinnamon-drab. Unlike the United States strains, the experimental material produced no sclerotia but frequently exhibited a growth of short, dark brown aerial hyphae. The mycelium is characterized by terminal and intercalary swellings and 'racquet hyphae'. The sterigmata sometimes occur on the conidiophores in whorls of two to five. Normally the spores are borne singly, but they may collect in groups when several in succession are produced by a sterigma.

A fungus of the *Scedosporium* type, isolated from a potato tuber, is stated to have been identified by G. R. Bisby as a species of *Geomyces*.

REDAELLI (P.) & CIFERRI (R.). **Una possibile nuova specie del genere Histoplasma : H. pyriformis (Moore) Cif. et Red.** [A possible new species of the genus *Histoplasma*: *H. pyriformis* (Moore) Cif. & Red.]—*Boll. Soc. ital. Biol. sper.*, x, 7, pp. 567–570, 1935.

According to a private communication from F. D. Weidman, of the University of Philadelphia, Moore's reputed new species of *Posadasia*, *P. pyriformis* [*R.A.M.*, xiv, p. 582], was isolated from the case described by Hansmann and Schenken as due to an undetermined species of *Sepedonium* [ibid., xiv, p. 235]. Attention is drawn to the very close resemblances between the organism in question and the type species of *Histoplasma*, *H. capsulatum* [ibid., xiv, p. 631], and in the writers' opinion the former should in fact be transferred to *Histoplasma* as *H. pyriformis* (Moore) Cif. et Red. n.comb. with *P. pyriformis* Moore and *S.* sp. Hansmann and Schenken as synonyms.

[An expanded version of this paper is given by Ciferri (R.) and Redaelli (P.) in 'Une quatrième espèce du genre Histoplasma'.—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 7, pp. 245–252, 1935.]

Van Beyma Thoe Kingma (F. M.). **Ueber Cephalosporium serrae Maffei und Cephalosporium stühmeri Schmidt et van Beyma, zwei gute Arten der Gattung Cephalosporium.** [On *Cephalosporium serrae* Maffei and *Cephalosporium stühmeri* Schmidt & van Beyma, two good species of the genus *Cephalosporium*.]—*Zbl. Bakt.*, Abt. 1 (*Orig.*), cxxxiv, 3–4, pp. 187–188, 1935.

The suggestion having been made by M. Focosi [*R.A.M.*, xiv, p. 36] that *Cephalosporium stühmeri* Schmidt & van Beyma is identical with *C. serrae* Maffei, the writer gives comparative morphological and cultural particulars clearly showing the differences between the two species. These include completely divergent types of colony growth and conidial dimensions besides the formation by *C. serrae* of brown chlamydospores which are absent in *C. stühmeri*.

Vernon (T. R.). **Studies on the mycological problems of dairying. I. The surface moulding of butter. II. The internal and subsurface discolorations of butter.**—*J. Dairy Res.*, vi, 2, pp. 154–174, 1 pl., 6 graphs, 1935.

The following fungi were obtained in over 2,000 isolations from definite superficial discolorations on samples of the butter consignments arriving at the Port of London from various countries, chiefly New Zealand, Australia, Denmark, Central Europe, Russia, South Africa, and the Argentine: five strains of *Cladosporium herbarum*, nine forms of *Penicillium*, three representatives of the *Aspergillus glaucus* group, *Alternaria* sp., *Stemphylium* sp., *Fusarium* spp. (including *F. culmorum*), and eight forms of *Phoma* [*R.A.M.*, xiii, p. 443; xiv, pp. 237, 633]. The first five of these were further isolated repeatedly from spots on wood and parchment, the former also occasionally bearing small patches of *Phoma* pycnidia. *P. alternariaceum*, only once isolated from butter, was three times cultured from discoloured wood, the greenish spots on which were also found to be associated with contamination by *Trichoderma lignorum*. Other occasional agents of superficial infection on butter included *Mucor*, *Verticillium*, *Gliocladium*, *Stysanus*, and *Acrostalagmus* spp., *Oospora lactis*, and *Trichothecium roseum*.

C. herbarum was consistently isolated from bluish-black spots of variable size and shape, *Phoma* and occasionally *Alternaria* from a large, spreading, muddy-brown blemish, *Penicillium* or members of the *Aspergillus glaucus* group from green surface growths, *Stemphylium* sp. from small, black spots, and *F. culmorum* from an extensive bright reddish-pink area in New Zealand and Australian samples. A hitherto unidentified organism with a brownish mycelium, exuding a vivid yellowish-brown pigment into the medium, was isolated from a fairly common orange-yellow discoloration of considerable extent. The fungi were experimentally shown to be capable of reproducing the conditions with which they were associated.

Fungal infection of butter is promoted by humid conditions and high temperatures. Butter inoculated with spores of the above-mentioned fungi was stored at 15° to 18° F. for varying periods from three months to over two years without developing any trace of discoloration, a result that may be generally verified in ordinary commercial practice.

From the blue-black subsurface and internal discolorations of unsalted or lightly salted samples six strains of *C. herbarum* were isolated and used in inoculation experiments with positive results. The colour and extent of mycelial growth varied considerably, being very sparse and intensely dark olive-green in a heavily sporing strain, cream-coloured and luxuriant in two others producing scanty spores. Four of the strains survived 3½ months' exposure to a temperature of 20° to 24°, but none withstood the normal cold store temperature of 15° to 18°.

NEILL (J. C.). **Prevention of mould-growth on box-timber.**—*N.Z. J. Agric.*, li, 1, pp. 22–26, 2 figs., 1935.

The results of the experiments briefly reported in this paper showed that dipping white pine (*Podocarpus dacrydioides*) boards, destined for making butter-boxes, in a 0·1 per cent. solution of shirlan WS [*R.A.M.*, xiii, p. 791] for ten minutes at about 56° F., rendered the boxes extremely resistant to the development on them of the more common box mould fungi with which the wood was inoculated, namely, *Cladosporium herbarum*, *Alternaria* sp., *Penicillium expansum*, *P. puberulum* [cf. ibid., xiii, p. 514 and preceding abstract] and *Pullularia pullulans* [ibid., ix, p. 77; xii, p. 605]. It is pointed out, however, that complete immunity from the establishment of the moulds on the treated wood could not be obtained even by steeping the wood up to 60 minutes in a 1 per cent. solution of shirlan WS.

STUART (L. S.). **The production of lipolytic and depilating enzymes by the Aspergillus flavus-oryzae group.**—*J. Amer. Leath. Chem. Ass.*, xxx, 6, pp. 315–321, 1935.

Nine of 36 strains of the *Aspergillus flavus-oryzae* group (supplied by C. Thom) yielded enzymes capable of completely loosening the hair from salt-cured, soaked calfskin [cf. *R.A.M.*, vii, p. 385], while a further six exercised a similar but slighter effect. No correlation was detected between the lipolytic and depilatory properties of the various strains, all of which showed a certain capacity, varying widely in individual cases, for lipase production [ibid., xi, p. 636; xii, p. 47]. Calculated on a dry weight basis, however, the most actively lipolytic strain produced only 0·0005 Willstätter lipase units per mg. as compared with 0·0027 for the same amount of pancreatic tissue.

ARMAND (L.). **Le mildiou de la laine.** [Wool mildew.]—*Rev. gén. Teint.*, xii, 9, pp. 675, 677, 679; 10, pp. 751, 753, 755; 11, pp. 831, 833, 835; 12, pp. 917, 919, 921, 923, 1934; xiii, 1, pp. 23, 25, 27, 1935.

A detailed account is given of the writer's two years' researches in French factories on the effect of dyes on the development of mildew in wool [*R.A.M.*, xiv, p. 585]. None of the substances tested was found to possess antiseptic properties, or at any rate not in a sufficient degree to render it commercially interesting. Only when the dye molecule contained a large number of certain electro-negative groups, especially the halogens (iodine, bromine, and chlorine), the nitrate groups, and the carboxyl radicals, was there any indication of a retardatory action on

the moulds concerned, the decisive factor in the growth of which is the presence in the wool of the degradation products arising from the albuminoid substances composing the fibres. These may best be eliminated by chromatation, while a certain protective value is also conferred by the admixture of copper sulphate, chromium fluoride, or formol with the dyes. On the other hand, mildew is favoured by all treatments tending to break down the keratin molecule in the wool, and more especially by the alkaline processes used in vat-dyeing.

BABEL (A.). **Neuere Versuche zur Lein-Beizung.** [Recent experiments in Flax disinfection.]—*Nachr. SchädlBekämpf., Leverkusen*, x, 2, pp. 70–73, 1935. [English and French summaries on pp. 101–102 and 104.]

Recent investigations at the Fibre Research Institute, Sorau, Niederlausitz [Saxony] are stated to have shown that the most important seed-borne diseases of flax are wilt (*Fusarium lini*) [*R.A.M.*, xiv, p. 634] and anthracnose (*Colletotrichum lini*) [ibid., xiii, p. 390], the latter apparently sparing none of the known varieties and occurring to the extent of 2 to 20 per cent. and upwards in the seed from all sources examined. Promising results in the control of these fungi have been obtained by dusting the seed with ceresan [ibid., x, p. 597; xi, p. 182], which reduced the number of diseased plants from 493 out of a total of 600 to 44 out of 500, besides increasing germination by up to 13 per cent.

SMITH (K. M.). **Some diseases of ornamental plants caused by the virus of Tomato spotted wilt.**—*J. R. hort. Soc.*, lx, 7, pp. 304–310, 5 pl., 1935.

The author calls attention to the damage done to ornamental plants by the tomato spotted wilt virus [*R.A.M.*, xiv, p. 725] and to its further potentialities for harm, owing to the very wide range of host plants susceptible to it, and gives an annotated list, admittedly incomplete, of diseases caused by the virus in ornamental plants. Besides a number of species already noticed from time to time in this *Review*, the symptoms caused by it are also described on *Salpiglossis* sp., stocks (*Matthiola* sp.), cauliflowers, *Zinnia* sp., chrysanthemums, and *Calendula*. On the Solanaceous hosts (apart from tomato) the most common symptom is the development of ring- or wave-like markings; on *Matthiola* the disease is severe and is characterized by crinkling and yellowing of the leaves; while other important hosts are chrysanthemum (which becomes stunted, the young leaves twisted and pallid, with some mottling and brown spotting of leaves and stems) and calceolaria (characterized by large, pale, irregular blotches on the leaves). Possible measures of control are briefly discussed, based on the destruction of the vector, *Thrips tabaci*, the removal of diseased plants, and the segregation of tomatoes from susceptible ornamentals.

MASSEY (L. M.) & JENKINS (ANNA E.). **Scab of Violet caused by Sphaceloma.**—*Mem. Cornell agric. Exp. Sta.* 176, 9 pp., 4 pl. (1 col.), 1935.

The results of further studies of the disease of cultivated violets

(*Viola odorata*) briefly described from the United States in a previous communication [*R.A.M.*, xii, p. 449] showed that the trouble is distributed and highly destructive in several of the eastern and south-eastern States, and that it has also been recorded in 1934 by T. H. Harrison in a garden at Richmond, New South Wales. The disease is known to affect the Mrs. David Lloyd George, Freys Fragrant, Princess Mary, Double Russian, Governor Herrick, Rosina, and Princess of Wales horticultural varieties, the three first named being highly susceptible; it has also been found occurring naturally on several North American wild species of the violet, and in one locality in New Jersey on pansies (*V. tricolor*).

In addition to the symptoms already described [loc. cit.], the disease may cause circular to irregular lesions, usually not over 1·5 mm. in diameter, on the inflorescence, capsules, and sepals.

Morphological and cultural studies of the causal fungus indicated that it is an apparently hitherto undescribed species of *Sphaceloma*, which is named *S. violae* Jenkins, English and Latin diagnoses being appended. The acervuli are pulvinate (often about 18 mm. in diameter) or effuse; the conidiophores are at first hyaline, slightly coloured later, pointed or obtuse, 0- to 1-septate, and 9 to 12 by 2 to 4 μ; the conidia are 0- to 2-septate, usually hyaline, and 2 to 5 by 3 to 15 μ; and the microconidia are minute, spherical, often agglomerated on the surface of the lesion. In pure culture the optimum temperature for growth and sporulation was found to be from 21° to 26° C.

The best field control of the disease so far obtained was by spraying with 4–4–50 Bordeaux mixture at intervals of ten days to two weeks.

Tasugi (H.) & Ikeno (S.). **On the intracellular bodies associated with the mosaic disease of the Lily. (Preliminary report.)**—*Ann. phytopath. Soc. Japan*, v, 1, pp. 30–43, 7 figs., 1935. [Japanese, with English summary.]

In mosaic leaves of *Lilium speciosum* f. *rubrum* [*R.A.M.*, xiv, p. 634] the living cells showed the presence of vacuolate, round to ellipsoid, intracellular bodies which measured 8·9 to 68·6 by 6·9 to 34·3 μ and were in many cases larger than the host nuclei. In seriously affected plants they were abundantly present in the epidermal cells of the leaves, but in the early stages of the disease they were absent or sparsely distributed, in close contact with the host nuclei, round, without vacuoles, and resembled aggregates of particles. They withstood treatment with 15 per cent. sulphuric acid for 5 minutes, but though insoluble in alcohol, ether, or chloroform they dissolved rapidly in N/5 caustic soda solution. The P_H value of these bodies and the host nuclei lay between 4·0 and 4·8, approximately.

Pasinetti (L.) & Buzzati-Traverso (A.). **Su alcune forme di cancrena delle Cactacee dovute a nuovi micromiceti e ad un batterio.** [On certain forms of gangrene in Cactaceae caused by new micromycetes and by a bacterium.]—*Nuovo G. bot. ital.*, N.S., xlii, 1, pp. 89–123, 4 pl., 1935.

A morphological and cultural account [with Latin diagnoses] is given of five fungal and one bacterial species, which were isolated from

rotting tissues of certain cultivated Cactaceae in the Italian Riviera and are considered to be new to science, namely: *Fusarium cactacearum* from a basal dry rot of *Thelocactus nidulans*, and *F. cacti maxonii* from a similar rot of *Cactus maxonii*; *Sporotrichum cactorum* and *S. traversianum* from soft, black medullary rots of *Cereus peruvianus* and *Neomamillaria gülzowiana*, respectively; both kinds of rot progressed from the top to the base of the affected plants; *Monosporium cactacearum* from a wet, light brown medullary rot of *Coryphantha* [*Mamillaria*] *valida*; and *Bacterium cactivorum* from a wet, black rot progressing from the base to the top of *Cephalocereus* [*Cereus*] *senilis*. Inoculation experiments showed that both species of *Sporotrichum* and *M. cactacearum* are aggressive parasites, capable of penetrating through the uninjured cuticle of the host, while the two *Fusarium* and the *Bacterium* species are only wound parasites.

VERONA (O.) & CECCARELLI (A.). **Su di una tracheomicosi dell' Amaranto (Amaranthus tricolor L.) prodotto da una specie di Fusarium e da Verticillium amaranti n.sp. e, in genere, sulla biologia di alcuni Verticillium patogeni.** [On a tracheomycosis of the Amaranth (*Amaranthus tricolor* L.) produced by a species of *Fusarium* and by *Verticillium amaranti* n.sp., and on the biology of some pathogenic species of *Verticillium* in general.]—*Phytopath. Z.*, viii, 4, pp. 373–400, 8 figs., 5 graphs, 1935.

A comprehensive, tabulated account, followed by a bibliography of 60 titles, is given of the writers' studies on a typical tracheomycosis of *Amaranthus tricolor* at Bagni di Casciana, some 30 km. from Pisa, associated with an undetermined *Fusarium* of the *vasinfectum* group and a new species of *Verticillium*, *V. amaranti* [a Latin diagnosis of which is given]. The latter forms on bean-saccharose agar colonies, which are white at first, turning brownish-black, and assuming a crustaceous consistency. The bi- to tri-, rarely non-verticillate conidiophores measure 150 to 180 by 2 to 3 μ, the verticils consisting of three to four branchlets, 24 to 32 μ long, at the apices of which are borne heads of ellipsoid conidia, 4·8 to 6·4 by 3 to 3·2 μ; the catenulate or conglobate, olivaceous to black chlamydospores, 9·6 by 6·4 μ, form pseudosclerotia. In inoculation experiments with the *Fusarium* and *V. amaranti* on *A. tricolor* and *Sempervivum tectorum*, each fungus gave positive results on each host.

Nitrites were produced on a medium in which potassium nitrate was the source of nitrogen by *V. amaranti*, *V. albo-atrum*, *V. dahliae*, and *V. tracheiphilum* [*R.A.M.*, x, p. 758], and the first named further elaborated a thermostable substance inhibitory to the germination of wheat, lucerne, clover, and *Amaranthus* seeds placed in filtrates of the cultures. The optimum hydrogen-ion concentration for *V. albo-atrum* was found to be P_H 8·5, for *V. dahliae* 4·9, for *V. tracheiphilum* 5·6, and for *V. amaranti* 5·0. All four species made the best growth at 24° to 26° C., readily assimilated peptone, and utilized glucose as a source of carbon, while their growth was inhibited by malachite green and brilliant green [ibid., xiv, p. 583] at concentrations between 1 in 200,000 and 1 in 500,000.

Riker (A. J.), Jones (F. R.), & Davis (Marguerite C.). **Bacterial leaf spot of Alfalfa.**—*J. agric. Res.*, li, 2, pp. 177–182, 1 fig., 1935.

A brief account is given of a bacterial leaf spot of lucerne, which was first noticed in 1930 in experimental rows in two places at Madison, Wisconsin; it again occurred in the same places in 1931, but it was never found in lucerne fields. The first symptom of the disease is the appearance on the leaves of very small, water-soaked spots which may coalesce as they increase in size, especially along the midrib and at the ends of the leaflets, forming areas of dead tissue which soon dries. In spots attaining 2 to 3 mm. in diameter the centre is often yellow with a dark brown border surrounded by a straw-coloured halo. Stem lesions were not observed in nature, but developed in artificially inoculated plants. In later stages the spot is strongly reminiscent of certain spots caused by fungi, to which the disease may have been attributed many times in the past.

Isolations from diseased tissues yielded an apparently undescribed bacterium, which is named *Phytomonas alfalfae* (or *Pseudomonas alfalfae* and *Bacterium alfalfae* according to other systems of classification). It is an aerobic, motile, Gram-negative, non acid-fast, apparently non-sporulating and non capsule-forming rod, ranging from 0·93 to 4·56 by 0·28 to 0·77 μ (average 2·14 by 0·45 μ) in diameter. On nutrient agar it forms circular, convex, smooth, white to pale yellow colonies with smooth margins. It liquefies gelatine and hydrolyses starch, forms ammonia slowly in a nitrate medium, and clears litmus milk with digestion of casein. Its temperature relations are: minimum 4°, maximum about 36°, and optimum between 24° and 32° C.

Flachs (K.). **Einige weniger bekannte Gräserkrankheiten.** [Some lesser known grass diseases.]—*Nachr. SchädlBekämpf., Leverkusen*, x, 2, pp. 57–62, 4 figs., 1935. [English and French summaries on pp. 101, 103.]

Semi-popular notes are given on the grass diseases caused in Germany by *Aplanobacter* [*Bacterium*] *rathayi* [*R.A.M.*, xiv, p. 514], attacking chiefly *Dactylis glomerata* but occasionally found on rye and *Cynodon dactylon*; *Sclerotium rhizodes*, believed to be the agent of the so-called 'string of pearls' disease on a large number of species; *Epichloe typhina* [ibid., xiii, p. 706] on *Phleum* [*pratense*], *D.* [*glomerata*], *Agrostis vulgaris*, and other hosts; and the Myxomycete, *Spumaria alba* [*Mucilago spongiosa*: ibid., vi, p. 765], which during protracted wet periods forms on grasses and other plants. The distribution of the diseases in other European countries is indicated.

Ballard (W. S.) & Lindner (R. C.). **Studies of the little-leaf disease in California.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 1–10, 1935.

An account is given of observations (dating from 1924 in the case of the senior author) on the environmental relations and treatment of little leaf of fruit trees and vines in California [*R.A.M.*, xiv, p. 642 and next abstract].

In the spring of 1925 a block of eight-year-old Malaga grapes growing in a 'corral spot' (a plot of ground formerly occupied by livestock),

found to be severely affected by the disorder, were cut off and regrafted with scions from healthy vines. This treatment proving ineffectual, 35 of the diseased vines were transferred to a fresh locality in 1927, whereupon prompt recovery took place. In the writers' opinion the so-called 'corral spot sickness' is identical with little leaf. In 1934 the following percentages of disease were recorded on various fruits planted in a corral spot in 1931: Kelsey Japan plum 100, seedling pecan [*Carya pecan*] 100, Muir peach 92, Yellow Egg plum 75, Early Harvest apple 50, Payne's seedling walnut 25, and Malaga grape 23. These figures afford a general idea of the susceptibility of the experimental fruits and nuts to little leaf, besides showing the rapid and extensive progress of the disturbance in 'corral spot' plantings.

In an experiment carried out in 1934 cuttings from badly diseased Alicante Bouschet vines were planted in coarse sand and supplied with a certain amount of zinc from the galvanized pipe-line used in watering, with the result that the later foliage was free from little leaf.

In 1932 zinc sulphate and other materials were applied to the soil surrounding vines both in solutions and as dry salts with conflicting results. In 1933 early spring treatment of vines in sandy loam soil with 10 lb. zinc sulphate proved effective by the following June, while Becky Smith plums and old vines treated about the same time with up to 15 lb. zinc sulphate showed a marked improvement in 1934. Kelsey plums on heavy orchard soil were severely damaged by soil treatments with zinc sulphate (10, 15, or 20 lb.) applied on 30th March, 1934, indicating that this method of control should be confined to the dormant season. Striking results have been obtained by the injection of zinc sulphate into vines through holes bored in the trunk, but this method is slow, costly, of doubtful permanence, and liable to promote wood rots. In 1934 the condition of little leaf vines was greatly improved by spraying with a mixture of 10 lb. of zinc oxide or zinc sulphide plus 6 oz. zinc sulphate and an appropriate quantity of casein spreader in 50 galls. water, the object of this combination being to reduce the burning injury apt to accompany zinc sulphate alone without sacrificing the rapid efficacy of the compound. The best results on pecans were given by a zinc-ammonia solution, which was in fact generally promising apart from a tendency to damage the leaves under humid conditions.

The results of these investigations are thought to indicate that little leaf, rosette, and allied disturbances are caused by zinc deficiency, but whether the action of the zinc applied in the various treatments is direct or indirect must remain uncertain pending the growth of the susceptible plants in a zinc-free medium.

CHANDLER (W. H.), HOAGLAND (D. R.), & HIBBARD (P. L.). **Little-leaf or rosette of fruit trees, IV.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 11–19, 3 figs., 1935.

In nearly all Californian soils the fixing power for zinc has been found to be so high that soil treatments against little leaf with zinc compounds [*R.A.M.*, xiv, p. 176 and preceding abstract] are unduly expensive and their results uncertain, since a high fixing power not only necessitates a heavy increase in the amount of zinc required for curative purposes but also curtails the duration of its beneficial action. These disadvan-

tages may be counteracted by the admixture with the zinc sulphate of large quantities of ferrous sulphate. Treatment with 35 to 100 lb. impure ferrous sulphate containing zinc equivalent to 2 to 6 lb. zinc sulphate kept trees free from little leaf more than twice as long as the application of 5 to 25 lb. zinc sulphate alone.

The spraying of apricot, peach, and plum trees in the spring and early summer with a mixture of 10 lb. zinc sulphate and 5 lb. lime in 100 galls. water gave very satisfactory results, especially in the case of the first-named, whereas walnuts failed to respond and vines only benefited temporarily. In none of these trees were the effects of the treatment as pronounced as in citrus. Where the little leaf symptoms are restricted to the spring growth and do not involve late summer mottling zinc sulphate (10 to 32 lb. in 100 galls. with or without lime) may be applied to mature foliage in the autumn with satisfactory results. Peach, apricot, plum, and apple trees all put out healthy leaves in the spring following this treatment. Applications of zinc sulphate at high concentrations during the dormant season preserved even the most severely affected trees from little leaf until midsummer or later.

Good control of severe little leaf in vines was secured by brushing with a solution of 2 lb. zinc sulphate in 1 gall. water immediately after pruning, the wounds made by which apparently facilitate absorption of the zinc; in trees this treatment was less efficacious. Vines, apples, stone fruit, and walnuts reacted favourably to the insertion of zinc-coated nails or No. 2 diamond-shaped glazier's points. The response of citrus trees to the latter treatment was very slow when made at all, but favourable results were obtained with *Juglans hindsii*, fig, pecan [*Carya pecan*], Carolina poplar [*Populus canadensis*], *Melia* [*azedarach*], and *Ligustrum* [? *ovalifolium*]. The insertion of No. 0 glazier's points $\frac{1}{2}$ in. apart injured the bark of walnut trees, while peaches suffered severely from similar treatment ($\frac{1}{8}$ to $\frac{1}{2}$ in.) with zinc pieces or zinc-coated nails. The other fruit trees used in the tests were not adversely affected, and by widening the spaces between the points to 1 in. damage even to the sensitive peaches and walnuts was obviated. Further experiments are necessary to determine the risks of injury from this method of treatment and the duration of its therapeutic action.

Crosby (C. R.), Mills (W. D.), & Blauvelt (W. E.). **Protecting orchard crops from diseases and insects in western New York.**—*Ext. Bull. Cornell agric. Exp. Sta.* 313, 92 pp., 18 figs., 1935.

This bulletin represents an attempt to supply fruit growers of western New York with information concerning the latest developments in the practical control of fungal diseases and insect pests of the apple, pear, cherry, peach, plum, and quince. Spray calendars for each host are given and each of the diseases and pests is dealt with separately in popular terms. In a concluding section notes are given concerning the spray materials used.

Crosby (C. R.) & Mills (W. D.). **Protecting orchard crops from diseases and insects in the Hudson Valley.**—*Ext. Bull. Cornell agric. Exp. Sta.* 314, 89 pp., 16 figs., 1935.

This is a slightly modified version (omitting quince diseases) of the

Extension Bulletin 313 [see preceding abstract], calculated to apply to conditions obtaining in the Hudson Valley, New York State.

GOODWIN (W.), PIZER (N. H.), SALMON (E. S.), & WARE (W. M.). **The control of Apple scab: Allington Pippin, and Newton Wonder, 1934.** —*J. S.-E. agric. Coll., Wye*, xxxvi, pp. 55–61, 1 fig., 1935.

In further comparative spraying tests against apple scab [*Venturia inaequalis*: *R.A.M.*, xiii, p. 779] conducted in Kent in 1934, Allington Pippin trees given two pre- and two post-blossom applications of home-made Bordeaux mixture (8–12–100) and cotton-seed oil Bordeaux emulsion prepared as in the previous year's test [loc. cit.] showed, respectively, 2·3 and 3·2 per cent. scab-affected apples, as compared with 2·7 and 6·9 per cent. for Newton Wonder trees given the same treatments. In the unsprayed control plots the former variety averaged 31·8 and the latter 37·7 per cent. scabbed fruits. As infection was slight and occurred late it was not possible to ascertain any difference in the fungicidal efficiency of the two treatments.

AUSTIN (M. D.), JARY (S. G.), & MARTIN (H.). **Bordeaux mixture—nicotine combinations against aphis and Apple scab.**—*J. S.-E. agric. Coll., Wye*, xxxvi, pp. 95–99, 1935.

In spraying tests carried out in 1933 and 1934 apple trees given two pre-blossom applications of the combined fungicidal-insecticidal washes, Bordeaux-sulphite lye-nicotine and cotton-seed oil-Bordeaux-nicotine [see preceding abstract], showed at the end of the second season's treatment a lower aphis (*Anuraphis roseus*) infestation than the untreated controls and trees sprayed with ordinary Bordeaux mixture plus nicotine, but a heavier one than that generally found on trees treated with tar distillate washes. Both the modified Bordeaux washes gave as good control of scab [*Venturia inaequalis*] as did ordinary Bordeaux mixture. The cotton-seed oil-Bordeaux-nicotine spray caused less injury to the fruit and foliage than ordinary Bordeaux-nicotine or Bordeaux-sulphite lye-nicotine.

HALL (J. W.). **Special sulphur dust versus lime sulphur for Apple scab control.**—*Scot. J. Agric.*, xviii, 3, pp. 254–259, 1935.

In spraying tests [which are described, and the results of which are tabulated] conducted at two centres in Scotland from 1932 to 1934, lime-sulphur spray with casein added and a proprietary sulphur dust considerably reduced the incidence of apple scab [*Venturia inaequalis*], but no conclusions have as yet been reached as to the relative merits of the two treatments.

CARNE (W. M.) & MARTIN (D.). **Apple investigations in Tasmania: miscellaneous notes.**—*J. Coun. sci. industr. Res. Aust.*, viii, 2, pp. 71–75, 1935.

Continuing the account of their investigations into non-parasitic apple diseases [*R.A.M.*, xiv, p. 242], the authors refer to the confusion that exists in the naming of these disorders, especially the cool storage scalds [see next abstracts], and point out that superficial scald and deep or soft scald [ibid., xiv, pp. 41, 42] are readily distinguishable. There

is no evidence that these conditions [which are described] as they occur in ordinary cool storage are related. Neither ever passes into the other. Confusion, however, has probably arisen when troubles occurring during storage experiments with abnormal atmospheres have been wrongly identified as 'scald'. This was confirmed by an experiment in which Sturmer apples stored for 10 weeks at 34° F. in sealed containers (carbon dioxide being allowed to accumulate to pre-determined amounts maintained within narrow limits by blowing in a calculated amount of air daily), developed in addition to brown heart a disorder that was apparently identical with Kidd's and West's deep scald [ibid., iii, p. 145] and Thomas's invasive alcohol poisoning [ibid., x, p. 606]. Every reduction of oxygen was accompanied by an increase in the severity of the condition, which developed independently of the brown heart. Other Sturmer apples in similar containers kept at room temperature did not develop either condition in two months, though the amount of carbon dioxide present rose to 38 per cent. in 30 days. The apples with alcohol poisoning and those kept at room temperature developed a strong alcoholic flavour. That Kidd's and West's deep scald is not the deep scald of ordinary stores was recognized but not emphasized by Thomas, and has been overlooked by other workers.

The paper concludes with a table showing the differences observed by the authors between superficial scald, deep scald, and alcohol poisoning.

Plagge (H. H.) & Maney (T. J.). **Soggy breakdown of Winter Banana Apples.**—*Phytopathology*, xxv, 7, pp. 730–731, 2 figs., 1935.

From a recent comparison of the soggy breakdown occurring in Winter Banana apples stored in Iowa at a low temperature (31° F.) [*R.A.M.*, xiv, p. 592] with the condition known as soft scald [cf. preceding and next abstracts] in the Wealthy, Golden Delicious, and other varieties, the writers conclude that these two disorders are identical.

Allen (F. W.) & McKinnon (L. R.) **Storage of Yellow Newtown Apples in chambers supplied with artificial atmospheres.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 146–152, 1935.

This is a report on the first season's work on the control of scald and internal browning in Californian Yellow Newtown apples [see preceding abstracts] by storing the fruit at 40° to 42° F. in an atmosphere containing 10 per cent. each of carbon dioxide and oxygen. Under these optimum conditions, determined as the result of experiment, the apples kept firm and green and the flesh moderately crisp and juicy, though the flavour was slightly impaired. The use of oiled paper, previously shown to have little value in reducing scald in this variety, did not appear appreciably to improve the condition of the fruit.

Askew (H. O.). **The boron status of fruit and leaves in relation to 'internal cork' of apples in the Nelson district.**—*N.Z. J. Sci. Tech.*, xvii, 1, pp. 388–391, 1935.

The boron content of Jonathan, Dunn's Favourite, and Dougherty apples on soils in certain localities of the Nelson district, New Zealand, where 'internal cork' or 'corky-pit' is prevalent [*R.A.M.*, xiv, p. 592],

was found to be only about one-third as high as that of healthy fruit on an unaffected type of soil. The percentage of boron found in the different samples was inversely proportional to the severity of the disturbance. Boron deficiency is thought to be undoubtedly the primary cause of 'internal cork' on the soils in question.

Crowell (I. H.). **Compilation of reports on the relative susceptibility of orchard varieties of Apples to the Cedar Apple rust disease.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 261–272, 1935.

The scattered reports on the varietal reaction of apples to cedar apple rust (*Gymnosporangium juniperi-virginianae*) [*R.A.M.*, xiv, p. 684] in 36 States of the American Union have been collected and are here presented in the form of a tabular list of nearly 200 varieties, the degree of susceptibility of which to the disease is indicated.

Ogilvie (L.). **The fungus flora of Apple twigs and branches and its relation to Apple fruit spots. I. Review of literature and preliminary experiments.**—*J. Pomol.*, xiii, 2, pp. 140–148, 1935.

The author quotes from literature [36 titles of which are included in the bibliography appended] a number of cases in which the connexion between the fungus flora commonly occurring on the twigs and branches of apple trees in nature and fruit infection has been clearly established. A brief account is also given of his own preliminary experiments and observations in which he showed the capacity of certain apple branch and twig saprophytes (*Gloeosporium album* [*R.A.M.*, iv, p. 174], *Diaporthe perniciosa* [ibid., xiii, p. 524; xiv, p. 249], and *Alternaria*) to cause spots and rots on apples.

Liro (J. I.). **Finland: Apple powdery mildew (Podosphaera leucotricha).**—*Int. Bull. Pl. Prot.*, ix, 7, p. 151, 1935.

Powdery mildew of apples (*Podosphaera leucotricha*) [*R.A.M.*, xiv, pp. 639, 711] is stated to have been first detected in Finland in 1923, when prompt measures were adopted for its control [ibid., v, p. 190]. The disease reappeared, however, in a garden near Helsingfors in 1934, having been introduced on Swedish apple stocks in the previous year, and is considered seriously to endanger the Finnish apple-growing industry.

Wenzl (H.). **Beobachtungen über die Anfälligkeit von Birnensorten gegen die Weissfleckenkrankheit (Mycosphaerella sentina).** [Observations on the susceptibility of Pear varieties to the white spot disease (*Mycosphaerella sentina*).]—*Z. PflKrankh.*, xlv, 6–7, pp. 305–316, 1935.

The exceptionally severe outbreak of white spot of pears (*Mycosphaerella sentina*) [*R.A.M.*, xiv, p. 617] in Austria in 1934 afforded a favourable opportunity for the detailed study of varietal reaction to this disease. A table is given showing how the resistance or susceptibility of 89 varieties fluctuated according to the climatic and soil conditions of the six different nurseries included in the observations, indicating that ecological factors as well as hereditary tendencies are involved in the response of a given pear to infection by the fungus.

Of the varieties tested only Conference, Eva Baltet, Bergamotte, Fertility, and President Douard showed appreciable resistance to *M. sentina*, and of these only the two first named are resistant to scab [*Venturia pirina*], a much more serious disease than white spot in most fruit-growing districts. As in the case of *Entomosporium maculatum* [*Fabraea maculata*], the agent of leaf blight of quinces and pears [ibid., xii, pp. 181, 231], infection by *M. sentina* was found to be restricted to a comparatively narrow radius from the original site of invasion.

Brooks (F. T.) & Brenchley (G. H.). **A note on the recovery from silver-leaf disease of Plum trees on common Plum and Myrobolan stocks, respectively.**—*J. Pomol.*, xiii, 2, pp. 135–139, 1935.

The authors state that in an experiment, started in 1930 at East Malling, in which young plum trees, grafted on common plum and on myrobolan stocks, respectively, were artificially infected with *Stereum purpureum* [*R.A.M.*, xiv, p. 375], the number of recoveries from the silver leaf disease thus induced was by August, 1934, significantly higher in trees on common plum than in those on myrobolan stocks [cf., ibid., xi, p. 59]. Reference is also made to observations recorded from 1921 to 1931 in a plum stock trial at East Malling which showed a higher proportion of recoveries from silver leaf disease in trees on common plum stocks (20 out of 23) than on the myrobolan (26 out of 41).

Koch (L. W.). **Investigations on black knot of Plums and Cherries. IV. Studies in pathogenicity and pathological histology.**—*Sci. Agric.*, xv, 11, pp. 729–744, 4 pl., 1 fig., 1935. [French summary.]

In this paper, which concludes the series dealing with his studies on black knot of plums and cherries (*Dibotryon morbosum*) [*R.A.M.*, xiv, p. 593], the author gives a tabulated account of inoculation experiments carried out from 1930 to 1934, inclusive. Out of a total of 622 plum and cherry current year branches which were inoculated with suspensions of ascospores or conidia through wounds penetrating to the cambium only 19 (3 per cent.) developed black knots, and of these 16 (84 per cent.) had been inoculated during the month of May, and 3 (16 per cent.) during June. All inoculations made during the remainder of the year gave negative results. While only one knot resulted from the inoculation of branches over one year old with material from the fruiting surface of a plum knot, three knots were produced on old branches of *Prunus domestica* by 'patch grafting' on them pieces of unswollen host tissue taken from just beyond the border of knots. All the artificially produced knots became visible in the autumn of the year of infection; many produced the *Hormodendrum* stage during the autumn and perithecia during the following winter and spring, thus completing the life-cycle of the parasite within one year.

These results are considered to confirm the conclusion arrived at previously [loc. cit.] that over 95 per cent. of black knots originate on the current season's wood, and to indicate that the period during which infection can take place in nature is very limited (May and June), presumably owing to the fact that, while temperature, relative humidity, and amount and type of inoculum are undoubtedly important factors

in the epidemiology of the disease, the condition of the host is the outstanding factor which limits infection.

Histological studies of the knots at all stages of development showed that soon after the cambial region in the current year's wood is reached by the fungus, hypertrophy and hyperplasia of the host tissues set in; as soon as the medullary rays in this region are invaded, instead of forming the usual elements the cambium produces a relatively large number of parenchyma cells which are many times their normal size, as well as scalariform tracheids, frequently in contact with the mycelium. Although the fungus advances through normal xylem tissues during the dormant period of the host, it does not cause visible hypertrophy during the winter. The study also showed that the host and parasite are capable of living in intimate contact with each other for about six or seven months before pathological effects become apparent.

Recent experiments indicated that excellent control of the disease may be obtained by spraying the trees at 'full bloom' with 1 in 50 lime-sulphur, in addition to the applications previously recommended at the delayed dormant and petal stages [ibid., xii, p. 705].

Husz (B.). **Gyümölcsfapermetezési kisérletek.** [Spraying experiments on fruit trees.]—*Bull. Éc. hong. Hort.*, i, pp. 8–22, 6 figs., 1935. [English summary.]

Almost perfect control of red spot (*Polystigma*) [*rubrum*] (*Polystigmina rubra*) on three plum varieties, viz., Prune and Prune Muscat of Beszterce and French Prune of Agen, was obtained in Hungary in 1934 by four applications (on 26th March, 24th April, and 4th and 16th May) of 0·5 or 1 per cent. Bordeaux mixture [*R.A.M.*, xiii, p. 454], lime-sulphur, and a combination of lime-sulphur and calcium arsenate.

The best control of apple diseases (chiefly *Podosphaera leucotricha*) [see above, p. 771] and pests in two years' trials was given by a combination of 1 per cent. lime-sulphur with lead arsenate paste (containing 8·75 per cent. arsenic) or (for the later applications) with calcium arsenate (0·25 per cent. Arzola) [cf. ibid., ix, p. 46; xi, p. 253].

Harding (P. L.) & Haller (M. H.). **Peach storage with special reference to breakdown.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 160–163, 1935.

Physiological breakdown in stored peaches [cf. *R.A.M.*, ix, p. 789; x, p. 162], associated with a brown discoloration and mealiness of the tissues and insipidity of flavour, has been found to be most prevalent in the United States at a temperature of 40° F. At 31° to 32°, however, the fruit may be maintained in fair condition for periods of two to five weeks according to the variety, the shorter duration being indicated, for instance, for Belle, Champion, Hiley, and Carman, and the longer for New Jersey 66 and 12722, Late Crawford, and J. H. Hale.

Trotter (A.). **Deperimenti del Pesco, per parassitismo sulle radici di una nuova Monotospora.** [Peach wilt due to root infection by a new *Monotospora*.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno (Portici)*, iv, pp. 3–11, 2 pl., 2 figs., 1935.

In 1928, twelve 7-year-old grafted peach trees in an orchard of 700

growing at Salerno on land recently reclaimed by drainage suddenly wilted; a year later 150 were affected, and by 1933 only 100 still remained alive. The disease appeared suddenly each spring, causing a general yellowing and shedding of the leaves; fruiting ceased, and the trees rapidly withered and died. Apart from these symptoms, the only visible abnormality was that the cortex of the larger roots was conspicuously cracked in all directions and showed numerous large, raised lenticels, while the surface of the smaller roots was wrinkled.

Examination of the affected roots (in 1933) showed the presence of a hyaline, branched, apparently non-septate mycelium with hyphae 1·5 to 2 μ in diameter, throughout the diseased tissues. Smooth, dark, subglobose or ovoid aleuriospores 10 by 10 μ or up to 16 to 17 by 12 to 15 μ, with a wall 1·5 to 2 μ thick, and provided with a lighter area, probably a germination pore, were irregularly arranged on the hyphae; they were occasionally sessile, but usually borne on short, simple, hyaline aleuriophores somewhat thickened at the apex. No phialids or phialospores were seen. In culture aleuriospores were produced resembling those found in nature.

The fungus is considered to be a new species of *Monotospora*, and as it is regarded as being at least partly responsible for the death of the trees, it is named (with a Latin diagnosis) *M. parasitica*.

Harrison (T. H.). **Technical notes. Occurrence in Australia of Lambertella corni-maris von Höhnel, a brown-spored parasitic Discomycete.**—*J. Aust. Inst. agric. Sci.*, i, 2, p. 76, 1935.

The author records the occurrence in September, 1934, of apothecia of *Lambertella corni-maris* [*R.A.M.*, xiv, p. 451] on two mummified apricots at Bilpin, New South Wales.

Colby (A. S.). **Inheritance of Gooseberry leaf infection.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 397–399, 1 graph, 1935.

The present report deals with varietal reaction to anthracnose [*Pseudopeziza ribis*] and leaf spot [*Mycosphaerella grossulariae*: *R.A.M.*, xii, p. 640] in 1,301 gooseberry seedlings arising from the selfing and crossing of nine varieties. Factors for resistance to the two diseases (which appears to rest on a multiple basis) were shown to be carried by Transparent, Rideau, and Como, while several seedlings combined relative freedom from infection with the desirable qualities of spinelessness and large fruit.

Wolf (F. A.). **The perfect stage of Cercospora rubi.**—*Mycologia*, xxvii, 4, pp. 347–356, 8 figs., 1935.

A brief account is given of the author's investigations of *Cercospora rubi* [*R.A.M.*, ix, p. 290] in North Carolina, where it is stated to be capable apparently of attacking both wild and cultivated species of *Rubus*, including raspberries, dewberries, and blackberries; it is also common and widespread in the eastern United States, where in certain years it causes severe defoliation of the hosts, especially in commercial plantings. The results of the studies showed that the conidial stage present on the leaves during summer is succeeded by a perithecial stage, the initials of which (archicarps with trichogynes) are laid down

together with spermogonia, from late August to the end of October. The hypophyllous black, spherical to flask-shaped spermogonia, 20 to 25 μ in diameter, contain myriads of rod-shaped spermatia, 2 to 3 by 1 to 1·5 μ. The perithecia matured on leaves kept out of doors throughout the winter, by late April or early May. They are sparse, hypophyllous, globose, semi-immersed but later erumpent, black, with a papilla-like ostiole, and measure only 40 to 60 μ in diameter. The asci are fasciculate clavate, with a short pedicel; paraphyses are not present. The ascospores are distichous, hyaline or sub-hyaline, curved, oblong-cylindrical, divided into two unequal cells, and 11 to 14 μ long. The perithecial stage (the genetical connexion of which with the conidial stage was proved in cultural studies) is named *Mycosphaerella dubia* [with a Latin diagnosis].

The taxonomic study of the conidial stage showed that the later species *C. septorioides* and *C. bliti* are identical with it, while *C. rubicola* and *C. garbiniana* may also prove to be further synonyms.

LUCKAN. **Himbeerrutenkrankheit.** [Raspberry cane disease.]—*VerbMitt. Landesverb. Sachsen Obstb., 1935*, 7, p. 105, 1935.

The increasing susceptibility to cane blight (*Didymella applanata*) of the reputedly resistant Preussen raspberry [*R.A.M.*, x, p. 804] is stated to have greatly reduced the value of this variety for cultivation in Saxony. Only raspberry stock free from this disease may be sold under the regulations of the Reich Food Board. Crosses between raspberry and blackberry have constantly yielded progeny showing resistance to *D. applanata*, and the possibility of developing a desirable raspberry by this means should be considered.

HULL (R.). **Investigation of the control of spoilage of processed fruit by Byssochlamys fulva.**—*Rep. Fruit Veg. Pres. Sta., Campden, 1933–34*, pp. 63–73, [? 1935].

To investigate the presence of *Byssochlamys fulva*, an agent of spoilage in processed fruit [*R.A.M.*, xiii, p. 711], in a given material, advantage was taken of the resistance of the ascospore stage to heat. Samples of leaves, fruit, straw, and the like were collected in plugged sterile tubes, which were filled with hot potato-sucrose agar, acidified with hydrochloric acid to P_H 3, heated in a water bath at 80° C. for 30 minutes, sloped, and incubated when set at 30°.

Positive infections were obtained from diseased and healthy strawberry leaves in April (35 and 13 per cent., respectively), from leaves and straw in July (20 and 4 per cent., respectively), from ripe berries (26 per cent.), from leaves of various soft fruits near Colchester (4 out of 150 tubes), from Kentish orchards (5 to 25 per cent.), from two factories, and from all the Gloucestershire plantations of raspberries, loganberries, black currants, gooseberries, and plums inspected.

Investigating the possibilities of control of *B. fulva* in the factory, its elimination from the field being evidently impracticable, the writer found that various powerful disinfectants were ineffectual for this purpose. It was experimentally shown that a temperature of 92° is necessary to kill the ascospores in 1½ minutes. An increase in the sucrose content of the medium up to 20 per cent. was found to render the spores

more resistant to heat, but at higher concentrations the germination rate declined. Further studies are required to determine the best means of combining a treatment destructive to *B. fulva* spores with the exigencies of the canning process.

PLAKIDAS (A. G.). **Factors responsible for the small Strawberry crop in Louisiana this year.**—*Plant Dis. Reptr*, xix, 8, pp. 132–134, 1935. [Mimeographed.]

One of the principal factors in the exceptionally low production (only 43 crates per acre) of the 1935 Louisiana strawberry crop is stated to have been the crown rot caused by *Sclerotinia sclerotiorum*, which appears to have been favoured by the long wet spells and low temperatures in February and March, while the constitution of the host was weakened by frost injury. Taking the strawberry-growing area as a whole, some 15 per cent. of the plants were more or less severely affected.

STEVENS (N. E.). **An attempted analysis of the economic effects of Cranberry diseases.**—*Plant Dis. Reptr*, xix, 8, pp. 112–128, 4 graphs, 1935. [Mimeographed.]

In this analytical study of the effects of disease on the American cranberry market from 1913 to 1933, inclusive, the writer's attention has been confined to the fruit rots and the even more important false blossom [*R.A.M.*, xii, p. 231; xiii, p. 316]. At the very conservative estimate of an average reduction from decay of 25 per cent., a loss to the consumer is indicated of over 120,000 barrels, valued at $750,000 per annum, while the loss to New Jersey alone from false blossom reached, during a 10-year period, 35,000 barrels per annum, apart from depreciation of capital value estimated at 25 per cent. The various factors involved in an inquiry of this nature are discussed under the following headings: size and quality of cranberry crop in relation to producer and consumer; and the position of (*a*) groups of growers, (*b*) the individual grower, and (*c*) the consumer.

SERRANO (F. B.). **Control of bacterial fruitlet rots of the Pineapple in the Philippines.**—*Philipp. J. Sci.*, lvii, 1, pp. 29–62, 1 pl., 1 diag., 1 graph, 1935.

Between 1927 and 1930, from 27 to 55 per cent. of the pineapple fruits grown in the Philippine Islands were attacked by bacterial fruitlet rot caused by *Phytomonas* [*Bacterium*] *ananas* or by *Erwinia* [*Bacillus*] *ananas* [*R.A.M.*, xiv, p. 456] or both, 12 per cent. being a total loss.

Infection is favoured by incomplete closing of the eyes, fewness of the shoots around the fruit, allowing it to be bent to one side and become sun-scorched, high atmospheric temperature, and low fruit acidity, of which the first two and the last may perhaps be remedied by breeding and selection, the third by shading or by growing the fruit at elevations of about 2,000 ft., and the last, again, by the application of suitable fertilizers.

Very satisfactory control resulted from spraying the young fruits while in flower with Bordeaux mixture (3–4–50 during the first month,

4–5–50 afterwards) or lime-sulphur (33° Baumé, 1 in 80 during the first month, 1 in 70 subsequently) at fortnightly intervals for three to four months.

Under Bukidnon Province conditions two applications of potassium sulphate at the rate of 500 kg. per hect., made during the tenth and thirteenth months, reduced infection by approximately 16 to 17 per cent., increased the average weight per fruit by 0·2 kg., and raised the fruit acidity from P_H 4 to 3·8. The evidence obtained strongly indicated that the increased acidity of the cell sap and firmness of the tissues induced by the potash treatment were responsible for the resistance shown.

Cristinzio (M.). **Alcune malattie crittogamiche del Nespolo del Giappone ed in particolare la 'ticchiolatura'.** [Some fungal diseases of Loquat and, in particular, scab.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), iv, pp. 25–50, 4 pl., 6 figs., 1935.

In this account of loquat diseases observed in southern Italy the author states that the serious scab disease (*Fusicladium dendriticum* var. *eriobotryae*) [*R.A.M.*, xii, p. 231] is most prevalent in compact, wet soils, hot, rainy seasons, and coastal areas. The affected trees are conspicuous by their sickly foliage; the young infected leaves are contorted, thickened, covered with black spots, and lacerated at the edges, and quickly fall; the older ones are holed and the edges torn but remain attached. The branches are also attacked and after two or three years become markedly rachitic, while the fruiting is impaired or destroyed, affected fruits being quite unsaleable. The fungus is usually confined to the epidermal cells forming a stroma 20 to 60 μ thick, which ruptures the cuticle and bears conidiophores, measuring 10 to 48 by 5 to 8 μ with conidia 16 to 30 by 5 to 7 μ.

Sphaeropsis malorum Peck [*Physalospora obtusa*: ibid., xii, p. 396; xiv, p. 371] produces over the whole leaf surface round, yellowish, later blackish, finally grey, generally confluent spots with a dark rim. On the young branches it produces depressed areas on the bark which soon cracks and turns black. The lesions become cankerous and expose the woody tissues; if they girdle the branch, the part above rapidly withers. Black, unilocular, pyriform pycnidia, 500 to 1,200 by 200 to 500 μ in diameter, are formed on the affected tissues; the pycnospores are hyaline, later yellowish, finally fuliginous, oval, elliptical or slightly bow shaped, continuous, and measure 19 to 29 by 8·5 to 12 μ. Associated with these pycnidia on the branch cankers are others, subspherical-depressed in shape, measuring 200 to 600 μ in height and containing hyaline conidia, 18·5 to 27·5 by 8 to 12 μ. This type corresponds to *Macrophoma malorum* [ibid., vi, p. 423]. Both fungi are regarded as true parasites.

Ascochyta eriobotryae [ibid., xii, p. 396] was very prevalent near Naples on the leaves of otherwise healthy but debilitated trees; heavy and repeated infections caused premature defoliation. The affected leaves bore numerous round, chestnut, later light grey, erumpent, isolated, occasionally confluent spots with a dark rim. The semi-immersed, later erumpent pycnidia measured 150 to 400 μ in height,

and the cylindrical or ellipsoidal-elongated, frequently arcuate spores, slightly constricted at the median septum, measured 8 to 12 by 2 to 3·5 μ.

Brief reference is also made to a few other loquat diseases reported by different workers, including *Bacillus amylovorus* [ibid., xiii, p. 424], *Phoma eriobotryae* [ibid., xiii, p. 175], and *Phytophthora parasitica* [f. *eriobotryae*: ibid., vii, p. 186].

TAI (F. L.) & CHEO (C. C.). **A dry rot of Pomegranate fruit caused by Zythia versoniana Sacc.**—*J. hort. Ass. China*, i, 1, pp. 203–217, 12 figs., 1934. [Received October, 1935.]

This is an expanded account of the destructive dry rot of pomegranates (*Punica granatum*) caused by *Zythia versoniana* in China [*R.A.M.*, xii, p. 641]. The pyrites-yellow pycnidia are densely aggregated, erumpent, 56 to 144 by 62 to 131 μ, and the hyaline, fusoid pycnospores measure 13 to 19 by 3 to 5 μ. The minimum, optimum, and maximum temperatures for the growth of the fungus were found to be about 12·5°, 24° to 28°, and 35° C., respectively. The dead fruits left hanging on the trees constitute an important source of primary infection since the dormant mycelium in them resumes activity in April, producing crops of fresh pycnidia. The application of Bordeaux mixture considerably reduced the incidence of infection by *Z. versoniana* in 1933. The Yushutze pomegranate has been found resistant to the dry rot, while Funpi is very susceptible.

MILANEZ (F. R.). **Notas sobre a galha lenhosa da Goiabeira.** [Notes on a woody gall of the Guava.]—*Rodriguésia*, i, 1, pp. 3–7, 7 pl., 1935.

A detailed account is given of the author's histological studies of large woody galls on the trunk of guava trees (*Psidium guajava*), which are stated to be common in the Minas Geraes State of Brazil. He attributes the origin of these galls to the presence in the cambium of a fungus (presumably a Phycomycete) which he was not able to identify as it could not be cultured from the material submitted to him.

TAVERNETTI (J. R.). **Characteristics of the resistance type soil sterilizer.** —*Agric. Engng St. Joseph, Mich.*, xvi, 7, pp. 271–274, 1 fig., 1 diag., 6 graphs, 1935.

Summing up the results of experiments conducted in California to ascertain the behaviour of the 'resistance' (electric) soil sterilizer [*R.A.M.*, xiv, p. 519] under varying conditions of soil and equipment, the writer concludes that the advantages of this method lie in the simplicity and inexpensiveness of the apparatus, its easy, rapid, and semi-automatic operation, and the uniform heating obtained. Its two serious drawbacks are the risk of electric shock (especially with the bench sterilizer, which cannot, in contrast to the box type, be enclosed) and variable electric load.

DAVIES (C.) & SMYTH-HOMEWOOD (G. R. B.). **Investigations on machinery used in spraying. Part II. Nozzles.**—*J. S.-E. agric. Coll., Wye*, xxxvi, pp. 62–85, 4 pl., 12 figs., 2 graphs, 1935.

Using the method previously described for the accurate measurement

of a sprayed area of foliage [*R.A.M.*, xiii, p. 790], the authors carried out a series of tests [the results of which are tabulated] on apple trees 10 to 20 ft. high under commercial conditions in the field, the data obtained showing an average cover of about 78 per cent. The area covered was estimated by placing a $\frac{1}{10}$ in. mesh screen over the disk record and counting the number of squares showing any deposit. The 'spray cover efficiency' (based on area covered, atomization [graded as fine, medium, and coarse, with a maximum value of 60], and uniformity [even, fair, uneven, maximum value 100]) averaged 62 per cent. When different pressures and nozzle settings were similarly tested the cover ranged from 60 to nearly 92 per cent. In laboratory tests of different makes and patterns of nozzles it was found that the increased weight and greater back pressure which result from the use of multiple clusters of nozzles on one lance can largely be obviated by employing nozzles made of some light metal such as duralumin alloy and much shorter lances. As a pair of nozzles, side by side, moved horizontally produces a narrower, more heavily drenched bank of spray than when moved perpendicularly, it is recommended that three nozzles should be used so mounted on one lance that the orifices form an equilateral triangle.

Emphasis is laid on the importance of basing the manner in which nozzles are grouped on the lance upon the conditions contributing to the most efficient spraying; it is fallacious to assume that merely using two or more in a cluster must result in a larger area being covered in a given time.

Schädlingsbekämpfung in Frankreich. [Pest control in France.]—*Chem. Industr., Berl.*, lviii, 16, pp. 293–294, 1935.

The total loss sustained annually by French agriculture through plant diseases and pests is estimated at an average of M.1,500,000,000. In the absence of exact information only a rough estimate of the value of the annual French production of plant protectives can be made, viz., M.25,000,000 to 30,000,000, of which 60 to 70 per cent. consists of copper sulphate, 10 to 20 per cent. of arsenates, and 20 to 30 per cent. of miscellaneous substances, while imports are estimated at M.5,000,000 to M.6,000,000. In addition to smaller quantities of other preparations, 70,000 tons of copper sulphate, valued at M.20,000,000 in 1934, are used annually in French vineyards; the home manufacture of this substance has been widely extended during the last few years. Data regarding arsenates and miscellaneous substances are also given.

Reckendorfer (P.). **Zur Physikochemie der Kupferkalkbrühe (Haftfähigkeit als Quellungserscheinung).** [On the physico-chemistry of Bordeaux mixture (adhesiveness as a function of swelling).]—*Z. PflKrankh.*, xlv, 6–7, pp. 341–353, 2 graphs, 1935.

The writer describes the technique and discusses the results of his experiments to determine the 'carrier' of the property of adhesiveness in Bordeaux mixture [*R.A.M.*, xi, p. 524; xii, p. 174; xiii, p. 597], and further to define the influence on this character of the lime used in the preparation of the compound. It was found that the adhesiveness of spray materials depends on the colloidal character of the spray deposit. Irreversible colloidal deposits show a tendency after drying to be almost

or quite incapable of further swelling and consequently are not easily washed off. The dehydrated hydrogel deposit of Bordeaux mixture owes its resistance to washing off by rain solely to its physico-chemical resistance to swelling in response to atmospheric factors.

In order to compare the adhesiveness of Bordeaux mixtures (with copper-lime ratios of 1: 1, 1: 1·5, and 1: 2) the swelling capacity of their dried deposits was recorded on the rotating drum of a special apparatus which is described in detail. The adhesiveness of the mixtures was found to increase parallel with the rising lime content to reach a maximum in the region of molecular saturation (phase III_2; corresponding to a copper sulphate-lime ratio of 1: 1·5), followed by an immediate decline, the swelling of the three mixtures increasing to relative constant values of approximately 12·0, 2·1, and 5·8, respectively, after 10 hours. However, the adhesiveness of the only mixture of practical importance (1: 1, phase III_1) is quite adequate, the amount of the fungicide washed off being inappreciable from the standpoint of plant protection, yet sufficient to obviate any risk of injury to health from its consumption with the harvested product.

Wood (Jessie I.). **Estimates of crop losses from diseases in the United States.—1931, 1932, and 1933.**—*Plant Dis. Reptr Suppl.* 87, 82 pp., 1935. [Mimeographed.]

The following are some of the data on the losses due to disease among the more important American crops in 1931, 1932, and 1933 [*R.A.M.*, xi, p. 769; xiii, p. 316]. The total wheat production for the three years amounted to 892,271,000, 744,076,000, and 527,413,000 bushels, respectively, the losses from all diseases during the same period being estimated at 66,091,000, 50,629,000, and 26,174,000 bushels, respectively. The total maize production for 1931 was 2,556,863,000 bushels with an estimated loss from all diseases of 200,584,000 bushels, the corresponding figures for 1932 and 1933 being 2,906,873,000 (291,347,000) and 2,330,237,000 (234,655,000) bushels, respectively. In 1931, 1932, and 1933 the potato yields totalled, respectively, 376,248,000, 358,009,000, and 317,143,000 bushels, with estimated losses of 57,766,000, 78,189,000, and 39,794,000 bushels, respectively. Figures are given of the losses from the chief individual diseases of each crop.

Storey (H. H.). **Virus diseases of East African plants. I. Introduction.** —*E. Afr. agric. J.*, i, 1, pp. 63–68, 1935.

In this paper, designed to be the first of a series upon the virus diseases of crop plants in East Africa, the author discusses in popular terms some of the characteristic features of virus diseases and the principles of their control in agricultural crops.

Köhler (E.). **Viruskrankheiten.** [Virus diseases.]—*Kranke Pflanze*, xii, 7–8, pp. 109–112, 1935.

An account is given in semi-popular terms of some recent important discoveries in connexion with virus diseases of economic and ornamental plants, with special reference to those bearing on the cultivation of these crops in Germany.

Trotter (A.). **Le 'virosi' del Cestrum parqui L'Hérit.** [Virus diseases of *Cestrum parqui* L'Hérit.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno (Portici)*, iv, pp. 18–24, 1 pl., 1 fig., 1935.

Cestrum parqui hedges growing in different parts of the Campagna were recently observed to show leaf abnormalities, consisting of various combinations [which are described] of surface wrinkling, edge waving, and chlorosis, apparently due to virus attack. The cells of the affected tissues showed inclusions and other cytological modifications typical of a virus disease. The author suspects that the disease, which resembles in some respects potato leaf roll and mosaic, has been acquired by this Solanaceous host from potato crops in the vicinity.

Bald (J. G.). **Statistical aspect of the production of primary lesions by plant viruses.**—*Nature, Lond.*, cxxxv, 3424, p. 996, 1935.

Referring to the recent paper in which Youden, Beale, and Guthrie suggest that the relation between the numbers of local lesions on the leaves of virus-inoculated plants and the relative concentrations of virus particles in the inoculum may be expressed as $y = N\ (1-e^{-ax})$ [*R.A.M.*, xiv, p. 601 and next abstract], the author points out that although this equation is, in all probability, fundamentally correct, and in the data cited by Youden *et al.* the values for the low dilutions are fitted by the equation, the calculated values for the higher ones are almost uniformly too small, and sometimes far beyond the limits of the experimental error. To plot the values of log $(N-y)$ against concentration and show that in selected cases the values fall approximately on a straight line gives a misleading idea of the fit, since when N is much greater than y, y may vary widely without causing wide departures from a straight line. Experimental data obtained by the writer and Samuel from dilutions of tobacco mosaic juice indicate that the relation of number of lesions to concentration could not be expressed by the function. The evidence obtained has shown that the equation applies only to very carefully purified suspensions of virus, distortions existing with samples so far purified that only slight pigmentation remained.

Youden (W. J.). **Statistical aspect of the production of primary lesions by plant viruses.**—*Nature, Lond.*, cxxxv, 3426, p. 1075, 1935.

The failure of Samuel and Bald to reconcile their experimental data concerning the production of primary lesions by plant viruses with the values calculated from the equation of Youden and his collaborators [see preceding abstract] is thought to be attributable mainly to a lack of conformity between the dilution data of the first-named workers and the curves obtained by others. It is true that the equation gives low values at high dilutions, but there is no indication that its application is limited, at least over a considerable range of dilution, to highly purified virus preparations. The writer concludes that Samuel's and Bald's data cannot be used to condemn the validity of the equation.

Chester (K. S.). **Serological evidence in plant-virus classification.**—*Phytopathology*, xxv, 7, pp. 686–701, 2 figs., 1935.

This is an expanded account of the writer's experiments, conducted

chiefly by means of the precipitin and complement-fixation techniques, to determine the serological relationships between a number of plant viruses, a preliminary note on which has already appeared [*R.A.M.*, xiv, p. 385]. In addition to those previously mentioned, potato mild mosaic and Osborn's pea mosaic virus No. 2 [ibid., xiv, p. 486] were found to represent distinct entities. The veinbanding virus of potato [ibid., xiv, p. 723] and cucumber mosaic [ibid., xiv, pp. 659, 660] appear from their strong mutual reactions, as well as from the outcome of inoculation tests, to be merely strains of a single virus which probably also includes Valleau's (Kentucky) tobacco virus 10729. Precipitin tests indicated a much more distant serological relationship between tobacco mosaic and severe etch of tomato [ibid., viii, p. 270]. Osborn's pea mosaic viruses Nos. 2 and 3, which were shown by these tests to differ from all the others studied, appear from their serological reactions to be strains of the same virus type. The usefulness of serologic reaction in the classification of viruses was confirmed by tests of virus samples submitted as unknowns, and the technique is considered to afford the chief line of attack in the study of the chemical basis of specificity.

CHESTER (K. S.). **The antigenicity of the plant viruses.**—*Phytopathology*, xxv, 7, pp. 702–714, 4 graphs, 1935.

As already shown by Helen P. Beale [*R.A.M.*, xiv, p. 197], the tobacco mosaic precipitin reaction was found in the writer's serological experiments [see preceding abstract] to be independent of host species within the Solanaceae, while Birkeland's observation [ibid., xiii, p. 545] that purified tobacco mosaic virus retains its specific precipitin reactivity was also confirmed.

When the tobacco mosaic, tobacco ring spot [ibid., xiv, p. 659], potato veinbanding, and potato ring spot [ibid., xiv, p. 385] viruses are inactivated either by series of progressive strengths of silver nitrate, potassium permanganate, or chloramine-T or by heating for ten minutes up to 100° C., and when tobacco mosaic is inactivated by successive changes of the hydrogen-ion concentration from P_H 0·5 to 12·0 or progressively fractionated by filtration, in each case the serological reactions are maintained during the presence of the virus in an active form, diminishing in strength *pari passu* with the loss of infectivity, and disappearing at the very point at which the virus becomes no longer demonstrable.

When the tobacco mosaic and potato latent mosaic (healthy potato or X) [ibid., xiv, p. 714] virus-immune sera are tested with their respective viruses propagated in hosts such as phlox, zinnia, and beet, only very distantly related to those used in serum preparation, serological reactions are still demonstrable, being correlated with the amount of inoculum independently of the hosts used.

Discussing these findings, and other evidence available concerning the antigenicity of the plant viruses, the writer thinks it may reasonably be concluded that the antigens responsible for the serological reactions under observation are the viruses themselves, and not the normal or derived constituents of diseased plants.

MATTIROLO (O.). **Un nuovo simbionte del Pioppo canadese. Nota I. Ancora sulla simbiosi del 'Tuber magnatum Pico' con i 'Pioppi canadesi' e osservazione sul processo di maturazione dei 'funghi ipogei'. Nota II.** [A new symbiont of the Canadian Poplar. Note I. A further report on the symbiosis of *Tuber magnatum* Pico with Canadian Poplars and observations on the process of ripening in hypogeous fungi. Note II.]—*Ann. Accad. Agric. Torino*, lxxvii, pp. 131–146, 1 pl., 1935.

Symbiosis has been found to occur in Piedmont between Canadian poplars (*Populus virginiana* Durr. and *P. monilifera* Ait. [*P. balsamifera* L.]) and *Tuber magnatum* in addition to *T. borchii* previously recorded [*R.A.M.*, xiii, p. 718]. The association is confined to alluvial, argillaceo-calcareous soils. Observations are made on the changes of odour (connected with glycogen reaction) and colour accompanying the ripening process in various kinds of truffles.

CHALLENGER (F.) & HIGGINBOTTOM (CONSTANCE). **The production of trimethylarsine by Penicillium brevicaule (Scopulariopsis brevicaulis).**—*Bio-chem. J.*, xxix, 7, pp. 1757–1778, 1935.

A detailed, fully tabulated account is given of the writers' experimental studies on the mechanism of biological methylation by the mould *Scopulariopsis brevicaulis* [*R.A.M.*, xii, p. 713]. No definite conclusion was reached in regard to the mode of formation of trimethylarsine from arsonoacetic acid, but it is presumed, on the basis of these and other investigations, to be of an enzymic nature.

CHALLENGER (F.). **The biological methylation of compounds of arsenic and selenium.**—*J. Soc. chem. Ind., Lond.*, liv, 28, pp. 657–662, 1935.

A full review and discussion are given of the literature on the methylation by moulds, especially *Scopulariopsis brevicaulis*, of arsenic and selenium compounds in the pigments of wall-papers, plasters, and the like [see preceding abstract].

VARADARAJA IYENGAR (A. V.). **Some biochemical factors of disease resistance in plants.**—*Curr. Sci.*, iv, 1, pp. 47–50, 1935.

Some general observations, amplified by references to the relevant contemporary literature, are made on the contribution of biochemical factors to disease resistance in plants. The subject is discussed under the following headings: nature of disease-resistant factors; isolation of inhibitory substances; individual chemical compounds in relation to disease resistance; reaction of tissue fluid; enzymes in relation to disease resistance; and disease susceptibility and nutritional factors.

ARATA (MARIA). **Il meccanismo dell'immunità nei vegetali.** [The mechanism of immunity in plants.]—Reprinted from *Boll. Ist. sieroter. Milano*, xiv, 6–7, 38 pp., 26 figs. (2 col.), 1935. [German summary.]

This paper, describing the author's investigations on the defensive reactions of vaccinated and unvaccinated beans [*Phaseolus vulgaris*] towards *Botrytis cinerea*, is the full Italian version of a shorter one already noticed from other sources [*R.A.M.*, xiv, p. 602].

McCrea (Adelia). **A supplementary note on longevity of Aspergillus oryzae and Rhizopus nigricans.**—*Pap. Mich. Acad. Sci.*, xx, pp. 79–80, 1935.

In 1919, 1927, and 1932, the writer readily obtained viable cultures on a number of standard media from dry 'spore dust' of *Aspergillus oryzae* [*R.A.M.*, xiv, p. 648], sealed in a tube in 1897. The fungus also remained alive for ten years on 4 per cent. glucose agar in a test-tube. *Rhizopus nigricans*, an accidental contaminant of the original culture of *A. oryzae*, survived the 30-year test in 1927 but was no longer viable in 1932 [cf. ibid., xi, p. 318].

Barrus (M. F.) & Crosby (C. R.). **Control of diseases and insect pests of Potatoes on Long Island.**—*Ext. Bull. Cornell agric. Exp. Sta.* 288, 26 pp., 4 figs., 1935.

This bulletin gives an outline, for the special use of Long Island potato-growers, of control measures, the efficacy of which has been established in practice against virus, bacterial, and fungal diseases, as well as against insect pests of the crop. It also gives a brief, popular account of the more important parasites and virus diseases of the potato in Long Island.

Brentzel (W. E.). **Types of Potato virus diseases in North Dakota.**—*Bull. N. Dak. agric. Exp. Sta.* 282, 23 pp., 12 figs., 1935.

Popular notes are given on the following virus diseases affecting the North Dakota potato crop: spindle tuber, rugose, mild, crinkle, leaf-rolling, and interveinal mosaics, leaf roll, mottled and unmottled curly dwarf, and witches' broom [cf. *R.A.M.*, xiv, p. 714]. The control of the diseases, based on the elimination of the insect vectors, roguing, and selection by tuber-indexing, is briefly discussed.

Barton-Wright (E. C.), Cockerham (G.), & M'Bain (A. M.). **Virus disease research.**—ex *Rep. Scot. Soc. Res. Pl. Breed. Ann. gen. Meet. 25th July, 1935*, pp. 14–17, 1935.

Further investigations at Corstorphine Plant-Breeding Station and the North of Scotland Sub-Station into the physiology of potato virus diseases [*R.A.M.*, xiii, pp. 321, 721] showed that the main differences between healthy and crinkle plants are that protein synthesis occurs later in the growing season in diseased than in healthy plants, that protein hydrolysis in crinkle plants is retarded, and that affected plants show interference with the normal channel of transport of nitrogen fractions.

In further breeding work, the Shamrock variety, resistant to virus diseases, was selfed and over 300 seedlings were raised with the object of finding out whether any segregation had occurred. The seedlings were classified as (*a*) apparently healthy or (*b*) virus infected. Evidence was obtained of two distinct types of resistance, viz., resistance to natural infection and tolerance of the pathogen after infection. No potato variety or seedling has been found to possess complete resistance to all the chief potato viruses, but a high degree of tolerance to individual viruses has been exhibited by some of them.

A comprehensive test of the copper strip method of discriminating between healthy and degenerate tubers [see next abstract] made on 600 tubers of 53 varieties showed the method to be of little value.

KAHO (H.). **Zur Physiologie der Kartoffel. II. Ein Beitrag zur Diagnose abbaukranker Knollen.** [On the physiology of the Potato. II. A contribution to the diagnosis of degenerate tubers.]—*Phytopath. Z.*, viii, 4, pp. 323–335, 1935.

Continuing his studies [*R.A.M.*, xiv, p. 465] on the physiology of potato 'degeneration' in Esthonia (where this condition is stated to be economically unimportant, mosaic being infrequent and leaf roll absent), the writer determined the oxidation-reduction rate of the tubers of nine healthy and three 'degenerate' varieties in an alcoholic guaiacum solution, details of the method adopted being given. The former group, including Imperator, Odenwälder Blaue, Deodara, Majestic, and Allerfrüheste Gelbe, responded so much more rapidly to the oxidation-reduction process (in 11 to 22 minutes) than the latter, comprising Bravo I and II and Imperator (which required 81 to 89 minutes), that a direct correlation may be established between velocity of reduction and vitality.

Tests were also conducted by the sheet copper method of Bechhold and Erbe [ibid., xiii, p. 649], which proved, however, less reliable for the end in view owing to the relative scantiness of melanin formation by potato tubers under the prevailing favourable ecological and climatic conditions of Esthonia.

PFANKUCH (E.). **Zur Biochemie des Kartoffelabbaues. III. Mitteilung: Ascorbinsäure, Glutathion und Zucker.** [A contribution to the biochemistry of Potato degeneration. Note III: Ascorbic acid, glutathion, and sugar.]—*Biochem. Z.*, cclxxix, 1–2, pp. 115–130, 1935.

No increase over the normal content of glutathion (2 to 5 mg. per cent.) and ascorbic acid (15 to 20 mg. per cent.) could be detected in the expressed juices of 'degenerate' potato tubers [*R.A.M.*, xiv, p. 650], the enhanced reducing capacity of which must be ascribed, therefore, to an augmented dehydrogenase activity.

In the expressed juices both of 'degenerate' potato tubers and of those (Klein-Spiegeler Wohltmann) artificially inoculated with the leaf roll virus [ibid., xiii, p. 533] the ratio of cane to reducing sugar was increased, an effect that may follow either a rise in the cane sugar concentration or a reduction in that of the monoses. The manner in which this change, as well as the increased dextrin content of 'degenerate' tubers, are brought about is discussed.

QUANJER (H. M.) & GÄUMANN (E.). **Versuche über den Einfluss des Klimas auf den Gesundheitszustand der Kartoffelpflanze.** [Experiments on the influence of climate on the state of health of the Potato plant.]—*Phytopath. Z.*, viii, 4, pp. 307–321, 1 fig., 5 diags., 1935.

Following a concise introductory survey of the literature on ecological factors in relation to potato degeneration [*R.A.M.*, xiv, pp. 54, 387,

and preceding abstracts], the writers give an account of preliminary experiments in Switzerland to determine the influence of altitude on the incidence, virulence, and course of mosaic (anecrotic type) [ibid., x, p. 746; xiv, p. 250].

The disease was found to persist in Eigenheimer tubers transferred from Wageningen, Holland, to the Alps, so that the practice of introducing infected material into relatively disease-free mountain regions should be discontinued as offering no hope of a cure. At a height of 1,680 m. above sea-level infection was transmitted from diseased plants to their healthy neighbours, though to a much lesser extent than in the foothills (455 m. above sea-level), where 10 per cent. mosaic may lead to the infestation of practically the entire crop in a year without any signs of physiological deterioration. An intensely severe form of the disease, accompanied by general stunting, may develop in addition to the common type in the mountains, possibly as a result of mixed infection [ibid., xiv, p. 388]. At 1,680 m. above sea-level the mosaic introduced in 1932 had not spread by means of fresh infections by the summer of 1933, whereas at 455 m. a considerable extension of the common mild symptoms was observed.

Ducomet (V.), Foëx (E.), & Alabouvette (L.). **Les maladies de la Pomme de terre.** [Potato diseases.]—Issued by Minist. Agric. France, 40 pp., 20 col. pl., 1 fig., 1 diag., 1935.

Semi-popular notes are given on a number of well-known potato diseases [the symptoms of which are illustrated by excellent coloured plates] occurring in France, with directions for their control. A useful key and some observations on selection and storage are appended.

Cristinzio (M.). **Le 'virosi' delle Patate 'Riccia' e 'Biancona' di Napoli nell'annata 1934.** [The virus diseases of Neapolitan 'Riccia' and 'Biancona' potatoes in the year 1934.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno (Portici)*, iv, pp. 51–65, 2 pl., 3 figs., 1935.

In a tour of inspection made recently in the vicinity of Naples to ascertain whether the decline in the yields of the formerly highly satisfactory Riccia and Biancona potato varieties might be due to virus diseases it was ascertained that the latter variety showed 15 to 35 per cent. leaf roll, 2 to 12 per cent. rugose mosaic, and 2 to 5 per cent. crinkle A [*R.A.M.*, xiv, p. 681], according to the locality; ordinary mosaic occurred on a few plants of this variety in two areas only. The Riccia variety showed 6 to 8 per cent. crinkle A, little or no rugose mosaic, and 1 to 2 per cent. witches' broom, the principal disease attacking this variety being dwarfing, probably due to some unidentified virus. The incidence of these virus diseases was sufficient to account for a reduction of yield by at least 20 to 30 per cent.

Porter (D. R.). **Insect transmission, host range, and field spread of Potato calico.**—*Hilgardia*, ix, 8, pp. 383–394, 7 figs., 2 diags., 1935.

A concise account is given of continued experiments at the California Agricultural Experiment Station [*R.A.M.*, xi, p. 320] on the transmission of potato calico, the results of which demonstrated conclusively

that the potato aphid (*Macrosiphum solanifolii*) [*M. gei*] is a vector of this disease. Calico was further shown to be transmissible by mechanical inoculation to tomato, pepper (*Capsicum annuum*), eggplant [ibid., xii, p. 615], *Datura stramonium*, and *Petunia* sp., but not to or from lucerne and certain weeds (*Ambrosia* and *Amaranthus* spp.), though these, when growing in the vicinity of calico-infected potatoes, frequently exhibit symptoms very suggestive of the disease. The results of experiments at Santa Clara, Stockton, and Davis clearly demonstrated the natural spread of calico on potato in the field. To test the effect of the date of sowing on the spread of calico, identical stock (halved tubers) was planted in 1931 at Stockton on 12th April, and at Davis on 16th June, previous experiments having shown that the rate of spread of potato virus diseases is practically the same in the two localities; the results showed that late planting reduced the percentage of spread from 55 at Stockton to 7 at Davis. This is considered to be a further confirmation of the fact established in a recent communication from the author [ibid., xiv, p. 714] that late planting in the Sacramento and San Joaquin valleys of California often produces potato seed stock relatively free from virus infection and capable of producing high yields in the next generation.

It is stated that, although still present in all the important potato-growing districts of California, calico has caused very slight losses during 1932, 1933, and 1934, maximum infection having been less than 3 per cent., with an average of less than 1 per cent. for the whole of the State. Besides White Rose, the most important variety grown, the disease has also been found on Bliss Triumph, Idaho Rural, and Garnet Chili, and it has been experimentally transmitted to a number of other varieties, including Early Rose, Green Mountain, and Irish Cobbler.

LINDFORS (T.). **Potatiskräftan i Sverige: dess utbredning och bekämpande intill år 1935.** [Potato wart in Sweden; its distribution and control up to the year 1935.]—*Medd. Växtskyddsanst. Stockh.* 11, 5 graphs, 3 maps, 1935.

A tabulated account is given of the distribution of potato wart [*Synchytrium endobioticum*] in Sweden [*R.A.M.*, xi, p. 533; xii, p. 51; xiii, p. 799] since its discovery in the Stockholm province in 1912, followed by apparently complete disappearance until 1928. At the time of writing the centres of infection throughout the country numbered 360, covering an area of 4,329 hect. The province of Halland shows the heaviest infestation, with 100 centres covering 2,026 hect., followed by Blekinge with 78 (545) and Örebro with 52 (540). After the intense activity of the fungus in 1928, when 97 fresh centres (1,020 hect.) were declared to be infected, there was a successive decline until 1931, when only 24 new cases were detected, followed by another rise to 79 in 1934.

Instances are cited showing that the spread of wart disease is largely effected by means of seed potatoes, while other important sources of dissemination include manure, domestic animals (especially poultry), agricultural implements, and running water. There is reason to believe that crows and other birds may be implicated in the transmission of the fungus over long distances.

Evidence of viability of the spores of *S. endobioticum* extending over a period of 13 years in Finland and 10 years in Denmark is quoted. Among the Solanaceae other than potato found susceptible to wart disease in inoculation experiments [cf. ibid., xiii, p. 652] are tomato and the weeds *Solanum nigrum*, *S. dulcamara*, and *Hyoscyamus niger*, none of which, however, would appear to be of practical importance in the spread of infection.

The results [which are briefly summarized] of soil disinfection experiments against wart disease in Sweden and elsewhere have not been generally encouraging from a practical standpoint. The legislation against *Synchytrium endobioticum* is discussed with special reference to its operation in the Scandinavian countries. From 1929 to 1935, inclusive, a total of 241,472 kg. of potatoes belonging to such immune varieties as Majestic, Arran Consul, King George V, Ackersegen, Erdgold, Hindenburg, and Parnassia was supplied under official supervision to growers in the infested areas of Sweden, and 13,000 kg. to those in other districts. All these are late varieties (except Parnassia, used for industrial purposes only) and the need for immune early sorts suitable for Swedish conditions is keenly felt. Juli and Dargill Early are slightly backward in development and their yellow flesh is also unacceptable, while Arran Crest and Arran Pilot are susceptible to a number of diseases and keep badly in Sweden.

Collins (E. J.). **The problem of immunity to wart disease (Synchytrium endobioticum (Schilb.) Perc.) in the Potato.**—*Ann. Bot., Lond.*, xlix, 195, pp. 479–491, 1935.

In this paper the author compares the results [which are tabulated] obtained by him at Ormskirk from 1915 to 1927 in tests for immunity from potato wart disease (*Synchytrium endobioticum*) [*R.A.M.*, i, p. 131; cf. also xiv, p. 389] of potato seedlings raised in breeding work for resistance to late blight (*Phytophthora infestans*), with those reported by Salaman and Lesley [ibid., iii, p. 169], and recently by Lunden and Jørstad [ibid., xiv, p. 251], in an attempt to throw some light on the problem of the inheritance of genetic factors for wart resistance. In his own trials selfed Majestic (immune) seedlings segregated on a basis closely approximating a 1 susceptible to 3 resistant ratio, and results of crosses of Majestic and other immune varieties tended to support this assumption. In the immune × immune class, a cross of Defiance × Leinster Wonder produced five seedlings, all of which proved to be immune, while the majority of the other crosses tested segregated in a ratio approximating 1 S to 3 R. In the selfed susceptible class he could only use the offspring from two proved susceptible seedlings (each obtained from crossing two immune varieties), one of which gave an entirely susceptible progeny, and the second gave 26 susceptible and 3 resistant descendants. These figures are taken to indicate complete susceptibility of the offspring. In the susceptible × susceptible class the results showed that British Queen, President, and Edgecote Purple are pure susceptible varieties. In the immune × susceptible class a total of 174 seedlings tested gave 82 S, 70 R, and 22 plants useless for the tests because of lack of vigour. While in some of the families there was an indication of segregation on the basis of an equality ratio, the group

as a whole is less amenable to explanation in view of the wide fluctuations which were observed. In the susceptible×immune class 184 seedlings gave 81 S, 82 R, and 21 'too poor' plants, a very close approximation to equality in segregation; there were, however, outstanding examples of individual deviation, as, for instance, in the Epicure×Majestic cross, which gave 1 S to 8 R.

In the author's opinion the bulk of the evidence appears to be in favour of a simplification of the problem of the inheritance of resistance to potato wart disease rather than the multiplication of factors for immunity and others for inhibiting them, each variety of potato being a law to itself.

Blodgett (F. M.), Mader (E. O.), Burke (O. D.), & McCormack (R. B.). **Three years' results using Bordeaux mixture with reduced amounts of lime as a Potato spray.**—*Amer. Potato J.*, xii, 7, pp. 171–177, 1935.

In continued experiments with Rural potatoes in New York State and with Green Mountains on Long Island [*R.A.M.*, xii, p. 653; xiv, p. 606] the authors confirmed the beneficial effect on yield of spraying the potatoes with Bordeaux mixture even in the absence of late blight [*Phytophthora infestans*], and also showed that it appears safe and desirable to reduce the lime in the mixture at least to half as much as the amount of copper sulphate. In one trial at Pittsford there was a clear indication that with a 5–1¼–50 mixture not so much copper per acre is necessary to give maximum yields as with mixtures containing larger proportions of lime.

Bates (G. H.) & Martin (L. D.). **Sulphuric acid spraying of Potato haulm to prevent late infection of the tubers with blight.**—*J. Minist. Agric.*, xlii, 3, pp. 231–235, 1935.

An account is given of experiments in 1934–5 at King's Lynn, Norfolk, the results of which showed that spraying the potato haulm in the middle of September, when it was still green, with a 10 or 20 per cent. dilution of brown oil of vitriol (containing 77 per cent. of sulphuric acid) rapidly killed the haulm and weeds and did not adversely affect the yield in 'ware' tubers, as compared with control plots, when the crop was lifted three weeks after the application. Examination of the stored potatoes 17 weeks after harvest showed that the percentage of tubers attacked by late blight (*Phytophthora infestans*) [*R.A.M.*, xiv, p. 527] was reduced from 3·9 in the control tubers to 0·66 and 0·49 in the tubers from the sprayed plots, respectively.

The costings of the experiments indicated that the treatment was financially justified even in a season when the incidence of late blight was slight, apart from the considerable advantages resulting from the destruction of the potato haulm and field weeds before harvest.

MacDowall (R. K.). **Potato blight. A new method of control by chemical spraying.**—*Scot. J. Agric.*, xviii, 3, pp. 243–249, 1 pl., 1935.

A detailed account is given of the method of control of potato blight (*Phytophthora infestans*) by destroying the haulms with a sulphuric acid spray [see preceding abstract].

Hori (M.). **On the relation between cell contents and the infection in Phytophthora infestans.**—*Ann. phytopath. Soc. Japan*, v, 1, pp. 10–22, 1935. [Japanese, with English summary.]

A study of the influence of plant excretions upon infection by *Phytophthora infestans* showed that when water was laid on the surface of the leaves of various plants (all those examined except young tobacco leaves) the zoospores were liberated by the sporangia, swam about, and finally became uniformly distributed on the surface of the leaves, their arrangement bearing no relation to the position of the stomata or the juncture of two epidermal cells. The zoospores were strongly or weakly attracted by the parenchymatous tissues of certain plants. Of some 80 chemical solutions tested, all the acid substances attracted, and all the alkaline ones repelled, the zoospores, while all the neutral agents were inactive. To penetrate the [epidermal] cell wall the fungus did not require the presence of soluble [attractive] substances in the cell, nor was such penetration affected by the alkalinity or acidity of the medium in which the zoospores were liberated. When inoculated on the under-surface of the stripped epidermis or on the surface of the sub-epidermal tissue of various resistant plants, *P. infestans* easily penetrated into the cells. It is concluded that until infection is established the cell contents have no effect on the behaviour of the fungus.

Da Silveira e Azevedo (N. A.). **Sobre a doença da Batatinha no municipio de Theresopolis.** [On the Potato disease in the municipality of Theresopolis.]—*Rodriguesia*, i, 1, pp. 9–12, 3 pl., 1935.

A serious potato disease in the municipality of Theresopolis, Brazil, characterized by the simultaneous wilting of the tops and a slimy rot of the tubers, was shown by isolations to be caused by *Bacterium solanacearum* [*R.A.M.*, xiii, p. 687]. While this appears to be the first official record of the disease in the locality, evidence indicates that it is of long standing there. Cutting seed tubers before planting is believed to favour infection of the resulting plants, and is therefore deprecated. The disease may be controlled by the use of seed tubers from healthy plants together with disinfection either by mercuric chloride (1 in 1,000) for $1\frac{1}{2}$ hours or with a 2 per cent. formalin solution for 2 hours, while some growers recommend 0·5 per cent. copper sulphate for 10 to 12 hours, followed by immersion in a 5 per cent. milk of lime.

Annual Report. Pathological Division.—*Rep. Rubb. Res. Inst. Malaya, 1934*, pp. 95–115, 2 graphs, 1935.

During the period under review the increasing importance of brown root disease of *Hevea* rubber due to *Fomes noxius* became apparent. Particular attention is now being paid in Malaya to the control of this and other root diseases (*F. lignosus*, *Ganoderma pseudoferreum*) [*R.A.M.*, xiii, p. 726], both in those areas where natural covers and rubber seedlings have been allowed to develop and in new plantings previously occupied by old rubber considerably reduced by root infection. The deterrent effect of 'forest conditions' on the spread of root disease is attributed to the loss of vigour of the rhizomorphs owing to their division into many small branches in an endeavour to pass through

the maze of roots present in forest-covered soils. In replanting old rubber all diseased roots in the infected areas should be eradicated completely by systematic digging.

In many tests the superiority of the tar distillate emulsions in the control of mouldy rot (*Ceratostomella fimbriata*) [ibid., xiii, p. 471] was again demonstrated, the best being killgerm and linsocresyl (each 10 per cent. in water), which controlled the disease after 16 and 17 daily applications, respectively.

Young clearings of budded rubber are stated to be frequently attacked by pink disease (*Corticium salmonicolor*) [ibid., xiii, p. 125]; it is recommended that water-miscible fungicides only should be applied to the comparatively delicate immature bark.

The delayed and very prolonged refoliation period in 1934 resulted in widespread infection by *Oidium heveae* [ibid., xiv, p. 331 and above, p. 743]. Very few cases of serious leaf fall occurred, however, and most of these concerned only small areas on poor soil, but mild leaf fall was present practically everywhere. During the season, attempts to dust some 25,000 acres with sulphur were hindered by the inclement weather, and it was not possible to give one treatment every seven days, but, on the whole, the dusting gave 50 per cent. control.

Bisby (G. R.), Timonin (M. I.), & James (N.). **Fungi isolated from soil profiles in Manitoba.**—*Canad. J. Res.*, xiii, 1, pp. 47–65, 1935.

Continuing their studies of the fungal flora of Manitoba soils [*R.A.M.*, xiii, p. 98], the authors give a briefly annotated list of 56 species of fungi not previously known to occur in these soils, which were isolated with others from 12 profiles of five types of virgin soil in Manitoba. In addition to the routine method of incubating dilution plates aerobically at 25° C., some plates were incubated aerobically at 37° or about 6°, and others anaerobically at about 20°. In a discussion of the more important species isolated in this and in the previous investigation [loc. cit.] it is stated that *Mortierella* spp. have proved to be the most abundant Phycomycetes in the soil profiles examined. Species of *Penicillium* constituted one-half of the isolations from the various horizons, in which species of *Aspergillus* were not found to be common; species of *Trichoderma* were much more frequent than the latter. The plates incubated at 37° showed a striking prevalence of *A.* spp., while those incubated at about 6° developed species of *Cylindrocarpon*, Mucorales, *Penicillium*, less frequently *Cladosporium*, and rarely other fungi.

The results of the investigation are considered to indicate clearly the occurrence of a definite fungal flora of the soil, especially when taken in conjunction with the work of Jensen [ibid., x, p. 550] and Ziling [ibid., xii, p. 191], who found the soil flora in Denmark and west Siberia, respectively, very like that in Manitoba, the former also showing the relative infrequence of species of *Aspergillus* in northern areas.

Ogilvie (L.) & Brian (P. W.). **Hot-water treatment for Mint rust.**—*Gdnrs' Chron.*, xcviii, 2535, p. 65, 2 figs. (1 on p. 64), 1935.

Complete control of *Puccinia menthae* [*R.A.M.*, xiii, p. 668] on two forms of the common forcing mint, *Mentha villoso-nervata*, was recently

obtained at the Long Ashton Research Station by ten minutes' immersion of the runners in water maintained at 112° F. A considerable degree of control was also obtained by watering the plants in the outdoor bed with a tar-oil wash in late autumn or early winter, but this process tended to injure the plants.

SALMON (E. S.) & WARE (W. M.). **The downy mildew of the Hop in 1934.**—*J. S.-E. agric. Coll., Wye*, xxxvi, pp. 48–54, 1935.

In this account of the hop downy mildew [*Pseudoperonospora humuli*: *R.A.M.*, xiii, p. 802] situation in England in 1934 the authors state that even during the drought in July runners were found with leaves bearing the conidiophores and spores of the fungus. However much suppressed by drought, the disease is seldom extinct on an infected plant. During the same period a few spikes capable of producing viable spores probably remained unobserved in most gardens, and accounted for damage to the burr and cones following rain in two districts.

New disease of the Hop.—*Fruit-Grower, Lond.*, lxxx, 2064, p. 15, 1935.

According to C. Savidge, County Horticultural Superintendent for Herefordshire, a serious outbreak of hop bine wilt has occurred in that county, the causal organism being identified by L. Ogilvie, of the Long Ashton Research Station, as *Sclerotinia sclerotiorum*, apparently not hitherto recorded as a parasite of this host in England or elsewhere. The attack of the fungus, which was fairly prevalent on lettuces [*R.A.M.*, xii, pp. 421, 485, 780] in the south-west area in 1934, is thought to have probably gained access to the plants through injuries sustained at the time of the mid-May (1935) frost.

SMITH (F. E. V.). **Rust disease of Pimento.**—*J. Jamaica agric. Soc.*, xxxix, 6–7, pp. 408–411, 1935.

Pimento [*Pimenta officinalis*] rust [*R.A.M.*, xiv, p. 656], first reported in the spring of 1934, was recorded early in 1935 from every parish in Jamaica except Portland. The causal organism, identified by Miss Wakefield as *Puccinia psidii*, is a common parasite of the rose apple [*Eugenia malaccensis*], and as this host was observed for several years to be severely affected in close proximity to healthy pimento, the pimento strain is almost certainly a very recent mutation of the other.

The disease attacks only the young tissues, causing early defoliation, death of the young twigs, and shedding of the flowers and young berries, with consequent reduction of yield; it has not so far proved fatal.

Spraying is considered impracticable because of the wide area affected, the necessity of making frequent applications to protect the young growth, and the fact that nearly all the trees are wild, none growing under plantation conditions where direct methods of control are economically advantageous. Though the damage already caused, especially in some districts, has been very severe, it is thought that the losses sustained will not be so serious with the return of normal weather.

HANSFORD (C. G.). **Sugar-Cane diseases in Uganda.**—*E. Afr. agric. J.*, i, 1, pp. 25–28, 1935.

A brief, popular account is given of the local history, symptoms, and control of sugar-cane mosaic [*R.A.M.*, xii, p. 422] and red stripe disease (*Bacterium rubrilineans*) [ibid., xiii, pp. 324, 686; xiv, p. 56] in Uganda, where the former is no longer economically important owing to the use of the resistant P.O.J. 2725 and 2878 canes. Red stripe is thought to have spread from some local grass, probably *Pennisetum purpureum*. The paper concludes with short notes on top rot [ibid., viii, p. 337], root diseases (which are almost non-existent in Uganda at present), and leaf spots (*Cercospora* and *Helminthosporium* spp.).

PETRAK (F.) & SYDOW (H.). **Kritisch-systematische Originaluntersuchungen über Pyrenomyzeten, Sphaeropsideen und Melanconieen.** [Original critical and systematic studies on Pyrenomycetes, Sphaeropsideae, and Melanconiae.]—*Ann. Mycol., Berl.*, xxxiii, 3–4, pp. 157–193, 1935.

The results of the authors' re-examination of a number of Spegazzini's genera and species of fungi are given [cf. *R.A.M.*, v, p. 331]. The type species of *Ephelidium*, *E. aurantiorum*, is stated by Spegazzini in *An. cient. argent.*, xl, p. 84, 1920, to be an imperfect stage of *Amylirosa aurantiorum* [*R.A.M.*, xiii, p. 437], other phases in the life-cycle of which are represented by *Pseudhaplosporella aurantiorum* and *Paradiplodia aurantiorum* [ibid., i, p. 350]. The identity of the two last-named with *Botryodiplodia lecanidion* (Speg.) Pet. & Syd. has been demonstrated in earlier researches by the writers. A critical inspection of Spegazzini's original material of *E. aurantiorum* (No. 1027 in his herbarium, collected in October, 1919) has convinced the authors that the fungus is a parasite of the *Botryodiplodia* stroma, entirely unconnected with its life-history. The genus should be cancelled owing to the anomalous nature of its diagnosis, part of which refers to the stroma of the fungal host.

The type species of Spegazzini's genus *Asbolisia* [ibid., iii, p. 211], *A.* (*Chaetophoma*) *ampullula* (*Physis, B. Aires*, iv, p. 293, 1918), has been found to be a parasite of *Meliola dubia* Speg. and is referred to the genus *Cicinnobella* as *C. ampullula* (Speg.) Pet. & Syd.

SYDOW (H.). **Beschreibungen neuer südafrikanischer Pilze VI.** [Descriptions of new South African fungi VI.]—*Ann. mycol., Berl.*, xxxiii, 3–4, pp. 230–237, 1935.

An annotated list, supplemented by Latin diagnoses, is given of 19 new species of smuts, Ascomycetes, and Fungi Imperfecti collected in South Africa, of which the following (all from Pretoria) may be mentioned. *Entyloma zinniae* n.sp. forms on the leaves of *Zinnia pauciflora* yellow, later brown, circular to irregular spots, 2 to 5 mm. in diameter; it is characterized by globular or subglobular spores, 8 to 12 or up to 13 μ in diameter, with a yellowish- or light-brown epispore, 1·5 to 2 μ in thickness. *Phyllactinia acaciae* n.sp., occurring on both leaf surfaces of *Acacia robusta*, has cylindrical conidia, often with a median constriction, obtusely rounded at both ends, 50 to 70 by 12 to

16 μ; perithecia 120 to 210 μ in diameter with 6 to 10 hyaline appendages, 70 to 120 by 25 to 35 μ, conspicuously swollen at the base; and 5 to 10 ovate or subglobose asci, 45 to 60 by 20 to 30 μ, containing 2 to 3 spores, 22 to 30 by 12 to 14 μ. The pseudosclerotia of *Balansia cynodontis* n.sp. are formed singly on the haulm nodes, mostly between two leaves, of *Cynodon dactylon*; they are erumpent, straight or curved, corniform, 0·5 to 1 cm. in length, with an irregularly bulbous swelling at the base, 2 to 3 mm. in thickness, tapering towards the apex. The stroma covering the upper side of the sclerotia is of variable extent; the densely crowded, oblong to lageniform perithecia measure 175 to 200 by 70 to 90 μ and are furnished with a papillate ostiole and dark-coloured walls, 8 to 15 μ thick; the elongated-cylindrical asci, 110 to 130 by 5·5 to 6 μ, are provided with an apical membranous sheath and contain 8 filiform, hyaline spores, about 1 μ in diameter.

MAINS (E. B.). **Michigan fungi. I.**—*Pap. Mich. Acad. Sci.*, xx, pp. 81–93, 5 pl., 1935.

Among the species included in this annotated list of 63 Michigan fungi are *Keithia* [*Didymascella*] *thujina* [*R.A.M.*, xi, pp. 22, 96], causing considerable defoliation of *Thuja occidentalis* in the upper Peninsula in 1933, and *Uromyces flectens*, the short-cycled rust correlated with the common long-cycled species *U. trifolii*, on white clover (*Trifolium repens*) [ibid., xiv, p. 241]. During 1931–2 repeated inoculations with *U. flectens* on white clover yielded only teleutosori, indicating that the species is distinct from *U. trifolii*. Lagerheim's description (*Svensk bot. Tidskr.*, iii, p. 36, 1909) unquestionably refers to the short-cycled rust, so that the retention of his name of *U. flectens* is advisable.

POVAH (A. H. W.). **The fungi of Isle Royale, Lake Superior.**—*Pap. Mich. Acad. Sci.*, xx, pp. 113–156, 4 pl., 1935.

The following are among the records of special interest in this annotated list of 525 fungi (of which 185 are believed to be new for the State) collected on Isle Royale, Lake Superior, Michigan, in 1930. 'Bluebottle' flies on grass tips were found to be parasitized by *Entomophthora bullata* Thaxt. sp. nov. ined. with very characteristic subglobose, bullate zygospores, 33 to 50 μ in diameter. The writer was informed by Thaxter that the conidia of *E. bullata* are indistinguishable from those of *E. americana* [*R.A.M.*, viii, p. 720]. Birches (*Betula alba* var. *papyrifera*) were severely attacked by *Nectria galligena* [ibid., xiii, p. 732], producing large black cankers, which also occurred in epidemic form on *Populus tremuloides*, causing a mortality of some 30 per cent. Witches' brooms due to infection by *Peridermium coloradense* [ibid., ix, p. 420] were observed on *Picea mariana* and *P. canadensis*.

BOSE (S. R.). **The distribution of some Polypores at our high altitudes.**—*Ann. mycol., Berl.*, xxxiii, 3–4, p. 201, 1935.

The following Polyporaceae, collected from the Lokra Hills, Assam (Bengal), at an altitude of 8,000 to 10,000 ft. above sea-level, are stated never to have been found in the Bengal plains, though common in north temperate regions: *Polyporus squamosus* [*R.A.M.*, xiii, p. 532],

P. sulphureus [ibid., xiv, p. 62], *P. gilvus* [ibid., xi, p. 275] f. *licnoides*, *Fomes fomentarius* [ibid., xiv, p. 62], and *F. pinicola* [ibid., xiii, p. 604]. The absence of these fungi from the Bengal plains is attributed primarily to lack of natural hosts, climatic factors being of secondary importance [ibid., xii, p. 579].

OVERHOLTS (L. O.). **The Polyporaceae of Pennsylvania. II. The genera Cyclomyces, Daedalea, Favolus, Fomes, Lenzites, and Trametes.**—*Bull. Pa agr. Exp. Sta.* 316, 16 pp., 2 pl., 1935.

In this, the second paper of this series [*R.A.M.*, xiii, p. 270], the author gives keys to the species of the genera *Cyclomyces*, *Daedalea*, *Favolus*, *Fomes* (which is divided into two sections, namely, *Leuco-* and *Fusco-Fomes*), *Lenzites*, and *Trametes*, which occur in Pennsylvania. Each key is followed by a resumé of the main characters of the species covered by it. The fungus previously referred by American authors to *T. protracta* or *T. odorata*, and by some regarded as a form of *L. sepiaria*, is described as a new species and named *T. americana* [with a diagnosis in English only]. It occurs on dead wood of coniferous trees and on structural timbers. Three new combinations are made, including *Fomes subroseus* [= *Trametes subroseus* Weir] and *F. robustus* var. *tsugina* (= *Fomitiporia tsugina* Murrill).

TAI (F. L.). **Notes on Chinese fungi. V.**—*Bull. Chin. bot. Soc.*, i, 1, pp. 11–35, 11 figs., 1935.

Continuing his studies on Chinese Erysiphaceae [*R.A.M.*, xii, p. 661], the writer gives critical and taxonomic notes on the 44 species (two of them new) and 4 varieties so far recorded for the country. *Microsphaera dentatae* Liou on *Quercus dentata* is renamed *M. alni* var. *dentatae* as it differs from the type only in the open, irregular branches of the perithecial appendages.

A key to the genera and species of Chinese Erysiphaceae and a host index are appended.

MATSUMOTO (T.) & YAMAMOTO (W.). **Hypochnus sasakii Shirai in comparison with Corticium stevensii Burt and Corticium koleroga (Cooke) v. Höhn.**—*Trans. nat. Hist. Soc. Formosa*, xxv, pp. 161–175, 2 figs., 1935.

The writers tabulate and discuss the cultural, morphological, and pathogenic differences between *Corticium sasakii* from rice, *C. stevensii* isolated from pear twigs sent by G. F. Weber from the United States and *C. koleroga* isolated by Narasimhan from coffee in India [*R.A.M.*, xiii, pp. 540, 804; xiv, p. 627]. Among the more important distinguishing features may be mentioned the sclerotial shape, colour, and dimensions in the three species. In *C. sasakii* these organs are subglobose or slightly flattened, sayal- to Verona-brown, 16 to 68 by 7 to 26 μ, mostly 26 to 42 by 11 to 20 μ, with fairly thick, brown walls; in *C. stevensii* somewhat flattened, mikado-brown to bistre, 10 to 52 by 4 to 9 μ, mostly 13 to 26 by 6 to 7 μ, with paler and thinner walls than the foregoing; and in *C. koleroga* subglobose, 16 to 55 by 7 to 17 μ, mostly 23 to 36 by 10 to 13 μ, with pale, thin walls. The last-named species, unlike the other two, does not form sclerotia in pure culture. Hyphal fusions were observed

to take place in homologous strains but in no case between the three species studied. Inoculation experiments made on *Codiaeum variegatum*, Japanese pear (*Pyrus serotina*), coffee, and *Gardenia angusta* var. *ovalifolia* showed that all these hosts except the first-named were infected by each of the three *Corticium* species, though differences in their virulence were apparent.

ASUYAMA (H.). **The life-cycle of heteroecious species of Puccinia. I. Puccinia culmicola Diet. and P. zoysiae Diet.**—*Ann. phytopath. Soc. Japan*, v, 1, pp. 23–29, 3 figs., 1935. [Japanese, with English summary.]

In inoculation experiments on wheat, aecidiospores of *Aecidium berberidis-thunbergii* taken from *Berberis thunbergii* var. *maximowiczii* growing in three localities failed to produce infection, but when barberry was inoculated with teleutospores of *Puccinia culmicola* obtained from *Agropyron semicostatum* abundant pycnidia (which when mature smelt of fish or glue) developed within two weeks, followed three weeks later by aecidia. Inoculations on the leaves of *Agropyron* and rye with these aecidia produced uredosori identical with those of *P. culmicola*. For this reason, and because of their morphological resemblances, *P. culmicola* is considered to be a form of *P. graminis*.

Teleutosori of *P. zoysiae* from *Zoysia japonica* sown on *Paederia chinensis* resulted in the production of aecidia identical with *Aecidium paederae* in 24 days.

BLOCHWITZ (A.). **Die Gattung Aspergillus. IV. Neue Arten. Synonyme. Varianten und Mutanten.** [The genus *Aspergillus*. IV. New species. Synonyms. Variants and mutants.]—*Ann. mycol., Berl.*, xxxiii, 3–4, pp. 238–250, 1935.

Continuing his critical studies on the genus *Aspergillus* [*R.A.M.*, xii, p. 396], the writer describes one new species, *A. hennebergi* [without a Latin diagnosis] and discusses the synonymy of a number of others. In connexion with observations on a series of variants and mutants, Mosseray's reclassification of the *A. niger* group [ibid., xiv, p. 334] is criticized and shown to be based on a very insecure foundation. Many of the species or varieties into which the group is arbitrarily subdivided are considered to be merely anomalies of growth resulting from unfavourable cultural conditions, bacterial contamination, or other external factors.

MUSKETT (A. E.), CAIRNS (H.), & CARROTHERS (E. N.). **Further contributions to the fungus flora of Ulster.**—*Proc. R. Irish Acad.*, Sect. B, xlii, 4, pp. 41–54, 1934. [Received October, 1935.]

This continuation of the authors' previous annotated list of Ulster fungi [*R.A.M.*, xi, p. 746] comprises 275 species and 9 varieties, making a total for the Province of 1,199.

Since the detection of *Corticium anceps* in a parasitic form on bracken (*Pteris aquilina*) [*Pteridium aquilinum*: *R.A.M.*, xiii, p. 815 and next abstract] in 1931, no evidence is forthcoming of any appreciable decline in the growth of the fern as a result of the activity of the fungus.

GREGOR (MARY J. F.). **A disease of Bracken and other ferns caused by Corticium anceps (Bres. et Syd.) Gregor.**—*Phytopath. Z.*, viii, 4, pp. 401–418, 11 figs., 1935.

Corticium anceps [see preceding abstract], which in nature has been found only on bracken (*Pteridium aquilinum*) and *Aspidium filix-mas*, was inoculated under controlled conditions into *A. spinulosum*, *A. aculeatum* var. *lobatum*, *Asplenium trichomanes*, *Polypodium vulgare*, *Blechnum spicant*, *Cystopteris fragilis*, and *Scolopendrium vulgare* with positive results.

The mycelium, composed of hyphae 3 to 7 μ in diameter, penetrates the host tissue by means of hyaline, convexo-discoidal infection cushions, 0·07 to 0·3 mm. in diameter, and 0·04 to 0·07 mm. in thickness, and also through the stomata. Basidia are formed superficially and constitute a white, felt-like coating on the under side of the fronds; under appropriate conditions the oval basidiospores, arising from large sterigmata, germinate on the hymenium, either by means of secondary spores on short promycelia [cf. *R.A.M.*, xii, p. 777] or more frequently directly by a germ-tube up to 85 μ in length. The fungus is readily cultivable on various nutrient media, on which numerous sclerotia but no basidia are formed.

The bracken disease [the symptoms of which are fully described] is stated to have been reported from Mecklenburg, Germany, as well as from Scotland and Northern Ireland. It is markedly affected by climatic conditions, having been very prevalent in Scotland in the wet summer of 1931, since when the drier weather has prevented severe outbreaks. Infection by *C. anceps* occurs almost exclusively on the fronds of bracken, never extending more than a few inches down the petiole and in no case involving the rhizomes. A *Corticium* fairly often observed at the base of the petioles at soil level appears to be quite harmless to the plants.

SMITH (K. M.) & BALD (J. G.). **A description of a necrotic virus disease affecting Tobacco and other plants.**—*Parasitology*, xxvii, 2, pp. 231–245, 2 pl., 2 graphs, 1935.

An account is given of an apparently hitherto undescribed virus disease which has been frequently observed on seedlings of White Burley, Virginia, and Vermont tobacco, and of *Nicotiana glutinosa* in the glasshouses of the Potato Virus Research Station at Cambridge; the same or a similar disease was also observed at the Waite Institute in South Australia during the years 1931–33. In tobacco seedlings at the two-leaf stage the disease caused a necrosis which spread from the base of the stem along the midrib, often killing the seedling within two or three days. In older, naturally infected seedlings the base of the stem was sometimes constricted by a ring of necrotic tissue, the necrosis occasionally extending up the midrib of the lowest leaf which was killed; this might occur in succession with several leaves, or the plant might eventually recover with no other symptom than a slight retardation of growth. In affected leaves the veins appeared sunken, the leaf curled over, and sometimes whitish etched lines appeared on either side of the veins. A characteristic of the disease was the restriction of the

symptoms to a few leaves, the virus never becoming wholly systemic in tobacco. Necrotic and yellow, rarely concentric rings developed, which on the older leaves often attained several centimetres in diameter and were comparatively faint and irregular in outline. Inoculation of healthy tobacco plants produced usually circular, necrotic lesions on the inoculated leaves, often in considerable numbers; sometimes the lesions were surrounded later by single necrotic rings, and occasionally the necrosis spread subsequently along the midrib and veins of one or two of the older leaves.

On *N. glutinosa* the virus produced on the inoculated leaves lesions which rapidly dried out and became white. Natural infections resulted in symptoms similar to those on tobacco, but the spread of the virus was even more restricted. Local symptoms were produced by inoculation on *Datura stramonium* and tomato, but except for two plants of the former the necrosis did not spread farther. Attempts to infect the potato gave negative results. Cowpea (*Vigna sinensis*), on the other hand, proved to be very susceptible to infection (by spraying the leaves with a suspension of the virus), but the virus very rarely spread beyond the inoculated leaf.

While a special series of experiments showed that in tobacco plants the virus is not present in tissues outside the lesions, it was occasionally found in the roots of young plants, usually in the case of natural infections. Its dilution end-point appeared to be 1 in 10,000; its longevity in extracted sap is about 20 days, and its thermal death-point is 72° C. So far as tested, the virus remained viable for 71 hours in 99 per cent. alcohol. Its particle size was found by the ultra-filtration method to be 20 to 30 $\mu\mu$.

Owing to the necrotic symptoms caused by the virus, the descriptive name 'tobacco necrosis' is suggested for the disease, but if the numerical system of nomenclature advocated by James Johnson is followed, the virus itself should be called 'tobacco virus 10'.

CHESTER (K. S.). **A serological estimate of the absolute concentration of Tobacco mosaic virus.**—*Science*, N.S., lxxxii, 2114, p. 17, 1935.

Assuming that the molecular weight of the tobacco mosaic virus [see above, p. 782, and next abstract] is 100,000 [*R.A.M.*, xiv, p. 115] and that the concentration of virus particles [ibid., xii, p. 528] is 3×10^7 per c.c., the concentration of the tobacco mosaic virus is 1 mg. in 200,000 l. of sap. If the tobacco mosaic virus is no more antigenic than the *Pneumococcus* carbohydrate (the most highly antigenic substance known, with a minimal precipitating concentration of 0·0004 mg. per c.c.), then 1 c.c. of tobacco mosaic sap (which gives a precipitin titre of 1: 250) contains at least 0·1 mg. of virus ($0{\cdot}0004\times250$). Or if compared with egg albumin, which has a precipitin titre of 1: 250,000 (0·004 mg. per c.c.), tobacco mosaic sap contains no less than 0·1 to 1·0 mg. per c.c.

Tobacco mosaic sap diluted to 1: 1,000,000 gives approximately one lesion per leaf on *Nicotiana glutinosa*, and about 0·1 c.c. of diluted sap is used in making the inoculation. From these facts and assuming the molecular weight of the virus to be 100,000, it follows that 1 c.c. of virus sap contains $6{\cdot}06\times10^{14}$ to $6{\cdot}06\times10^{15}$ molecules of virus and that a single minimal infective dose on *N. glutinosa* corresponds to 60 to

600 million virus molecules. The fact that only a single infection results from inoculation with such enormous numbers may be due either to the scarcity of places suitable for infection, e.g., the protoplasm exposed in the breaking of a leaf hair, or to the aggregation of virus particles.

LIVINGSTON (L. G.) & DUGGAR (B. M.). **Experimental procedures in a study of the location and concentration within the host cell of the virus of Tobacco mosaic.**—*Biol. Bull. Wood's Hole*, lxvii, 3, pp. 504–512, 1934.

Using a Chambers's micro-manipulation apparatus with a Spencer microscope giving a magnification of approximately $\times 260$, the writers carried out at Wisconsin University detailed cytological studies on the hair cells in sections (mounted in 20 per cent. glycerine) of mosaic-infected tobacco plants [see preceding abstract] to determine the location and concentration of the virus in the different parts. The infective principle was found to occur primarily, if not exclusively, in the protoplasmic contents of the cell, rather than in the vacuole. Evidence was obtained that the inclusion bodies occurring in the hair cells are products evolved by the agent; both the vacuolate and striated or so-called 'crystalline' types are fragile structures disintegrating on contact with the micro-needle or pipette and entering the smallest apertures.

RAMSEY (G. B.). **Pleospora rot of Tomatoes.**—*J. agric. Res.*, li, 1, pp. 35–43, 2 pl., 1935.

This is a full account of the author's studies of the tomato fruit rot caused in the United States by *Pleospora lycopersici*, a preliminary report of which has been noticed from another source [*R.A.M.*, xiii, p. 548]. In addition to the information already given it is stated that in the course of the last three years the trouble has become increasingly important in tomatoes shipped from California during November and December, and in Mexican shipments in January, losses as high as 50 to 90 per cent. having been reported in some carloads. Inoculation experiments showed that in both mature-green and ripe tomatoes little or no decay developed at temperatures below 45° or above 80° F., the optimum temperature being from 65° to 70°, but at all the temperatures tested the decay progressed more rapidly in ripe than in mature-green fruits. In cultures on potato-dextrose agar (P_H 4·7 and 6·01) the temperature relations of the fungus were: minimum 35°, optimum 70°, and maximum 90°. The optimum temperature for the development of the conidial stage, *Macrosporium sarcinaeforme*, was about 75°, and cultures with a tendency to produce this stage grew more rapidly than those in which the perithecial stage was dominant. At all the temperatures at which the fungus made appreciable growth, the growth rate was more rapid on agar having a P_H value of 6·01 (the average acidity of the ripe tomatoes) than at P_H 4·7 (the average acidity of the mature-green fruit).

McCLEAN (A. P. D.). **The bunchy-top disease of the Tomato. Host range of the bunchy-top virus.**—*Fmg S. Afr.*, x, 112, pp. 302–303, 4 figs., 1935.

A popular note is given on bunchy top of tomatoes in South Africa

[*R.A.M.*, xiii, p. 131], with special reference to the host range of the virus. This has been transmitted to *Solanum aculeatissimum*, *S. aculeastrum*, *S. duplosinuatum*, *S. incanum*, *S. panduraeforme*, *S. nigrum*, *S. sodomaeum*, *Nicandra physaloides*, *Physalis angulata*, *P. viscosa*, tobacco, eggplant, Cape gooseberry [*P. peruviana*], petunia, pepper [*Capsicum annuum*], and potato; in *P. angulata* and *S. nigrum* the symptoms of bunchy top are completely masked. The eradication of these Solanaceous weeds from the vicinity of tomato fields is therefore very important, though in the eastern Transvaal, where the crop is grown practically all the year round, diseased plants in the older fields probably constitute an important source of primary infection.

STOUT (G. J.). **Influence of watering treatment on the occurrence of blossom-end rot in greenhouse Tomatoes.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 515–518, 1935.

The results of an experiment conducted in 1932 in Pennsylvania to determine the influence of the time and amount of watering on blossom-end rot of Marhio tomatoes [*R.A.M.*, xiii, pp. 547, 663] indicated that heavy, infrequent applications (11 in six months) are more conducive to freedom from this disease than light, regular waterings (almost daily). However, since a certain amount of blossom-end rot occurred on all the plots, the ideal watering schedule probably lies between the two extremes tested.

GOIDÀNICH (G.). **Ueber die wahre Ursache des Burbanksterbens in Italien.** [On the true cause of the dying-off of Burbank Plums in Italy.]—*Z. PflKrankh.*, xlv, 6–7, pp. 335–340, 7 figs., 1935.

In view of the fact that widespread credence has been given to the report emanating from Dr. L. Franceschi and promulgated by Dr. Reinboth in *Z. PflKrankh.*, xlv, pp. 143–146, 1935 [which paper was not noticed in this *Review*] of the implication of *Graphium* [*Ceratostomella*] *ulmi* in the extensive dying-off of Burbank plums now proceeding in Italy [*R.A.M.*, xiv, p. 374], the writer recapitulates his evidence for regarding the disorder as a non-parasitic leptonecrosis [ibid., xiv, p. 454].

AUGHANBAUGH (J. E.). **Replacement of the Chestnut in Pennsylvania.**—*Bull. Pa Dep. For. Waters* 54, 38 pp., 1935. [Abs. in *J. For.*, xxxiii, 9, pp. 825–826, 1935.]

This is a review by A. G. Hall of a bulletin stated to cover an immense amount of detailed work accomplished by the author during the last five years on the economic, biological, and silvicultural problems created in south-eastern Pennsylvania by the death of the chestnut from blight (*Endothia parasitica*) [*R.A.M.*, xiv, p. 726].

Some 3,000 study plots were established in 1930 in regions where the chestnut formerly abounded—the Mont Alto and Michaux State Forests. Treating the blight damage as an excessively heavy thinning, the author found a decided growth acceleration among the chestnut's former associates—largely consisting of relatively undesirable species, such as rock oak [? *Quercus prinus*] and red maple [*Acer rubrum*]. The removal of chestnut competition increased by 80 per cent. the

diameter growth of the remaining trees. In stands where chestnut comprised the bulk of the stumpage the growing stock had been so heavily depleted that a 5 to 35 per cent. deficiency still exists, but in stands with less than 10 per cent. chestnut the volume is greater than before the attack. The quality of the stands might be improved by judicious felling, intensive fire protection, and supplemental planting of desirable types of oak and pine. That the chestnut maintains a tenacious hold on existence is shown by the recurrent sprouting from old stumps and the establishment of new seedlings, each fresh batch of shoots being apparently more resistant than the last [ibid., xii, p. 355].

RICCARDO (S.). **Contributo sperimentale per lo studio delle alterazioni interne delle Castagne.** [An experimental contribution to the study of internal spoilage of Chestnuts.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), iv, pp. 12–17, 1935.

As chestnuts treated before exportation from Italy with hot or cold water for the destruction of insect larvae sometimes show mould infection [*R.A.M.*, xiii, p. 65 and next abstract] upon arrival in America, the author carried out a series of tests to ascertain the effect of the treatment on fungal and bacterial invasion. The results obtained showed that both the hot and cold water treatments facilitate the entrance of micro-organisms into the chestnuts, that the thick silky covering on the inner surface of the pericarp offers considerable resistance to further penetration, and that the parts most liable to allow infection are the top of the chestnut and the basal scar. Immersion of treated chestnuts in an aqueous carmine solution showed that the dye penetrated in a manner similar to that of the micro-organisms.

TROTTER (A.). **Per la prevenzione contro l'ammuffimento delle Castagne.** [For the prevention of Chestnut moulds.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), iv, pp. 67–69, 1935.

After referring to the frequency of mould infection (*Rhacodiella*, *Penicillium*, *Trichothecium*, *Mucor* spp., etc.), and bacterial rots on chestnuts exported from Italy [see preceding abstract] the author gives brief directions for the control of these organisms by improved methods of orchard practice, harvesting, and storage, the removal of affected chestnuts throughout the various operations, and the planting, in the new groves, of resistant strains.

HAMOND (JOYCE B.). **The morphology, physiology, and mode of parasitism of a species of Chalaropsis infecting nursery Walnut trees.**—*J. Pomol.*, xiii, 2, pp. 81–107, 4 pl., 1935.

This is a full account of the author's comparative studies of the strains of *Chalaropsis thielavioides* from diseased walnut grafts and roots, carrots, and peach seedlings, the more important results of which have been noticed from another source [*R.A.M.*, xiv, pp. 408, 726].

VARADARAJA IYENGAR (A. V.). **Biochemistry of the spike disease of Vinca rosea Linn.**—*J. Indian Inst. Sci.*, xviiiA, 9, pp. 61–67, 1935.

As in the case of sandal [*Santalum album*] spike, in spiked *Vinca rosea* [*R.A.M.*, viii, p. 146; xiv, p. 539] the total ash and calcium

contents of the stem and leaf tissues are reduced and the nitrogen content increased as a result of the disease, in striking contrast to the depletion of nitrogen and increase of calcium which occur in affected roots. The protein content of diseased plants is generally lower than that of healthy ones, the reverse being observed in the case of ammonia. As in sandal spike, the calcium-nitrogen ratio in the diseased stems and foliage of *V. rosea* is distinctly lower than in healthy ones. Diseased stems and roots contain more starch and the leaves more starch and sugar than corresponding healthy specimens, but diastatic activity in the former is greater than in the latter. Similar observations in respect of starch and sugar contents and diastatic activity were made in spiked and healthy plants of *Zizyphus oenoplia*.

RANGASWAMI (S.) & SREENIVASAYA (M.). **Insect transmission of spike disease of Sandal (Santalum album Linn.).**—*Curr. Sci.*, iv, 1, pp. 17–19, 1–35.

Continuing their studies on the spike disease of sandal (*Santalum album*) [*R.A.M.*, xiv, p. 265], the authors give an account of two experiments carried out in 1934 (one in the midst of a heavily spiked area at Jawlagiri, and the other at Denkanikota, where the disease is only one-fifth as virulent), in which healthy sandal trees were put in insect-proof cages together with spiked ones, and insects, collected during the night, belonging to 252 and 190 different species, respectively, of the local sandal forest fauna, were released in the cages. By the end of April, 1935, 16 of the 37 healthy trees in the Jawlagiri cage became spiked, while no spread was noticed in the Denkanikota cage, although later one plant developed symptoms of the disease. The high percentage (43·2) of transmissions at Jawlagiri is considered to show conclusively that the disease is insect-borne, and also indicated that the insect vectors are active during the night. Suspicion falls on three types of Pentatomidae, two of Jassidae, and three of Fulgoridae, and experiments to determine the part played by them in the transmission of the disease are now in progress.

DARKER (G. D.). **Hypodermella hiratsukae, a new species of Hypodermataceae from Japan.**—*J. Arnold Arbor.*, xvi, 3, pp. 364–365, 1 pl., 1935.

Latin and English diagnoses are given of *Hypodermella hiratsukae* sp. nov., collected by N. Hiratsuka on the leaves of *Pinus pumila* in Ishikari Province, Japan, in August, 1927.

The shining black, oblong or elliptical hysterothecia of *H. hiratsukae* measure 0·54 to 1·30 by 0·26 to 0·34 mm. and open by a longitudinal fissure, the basal layer being colourless, plectenchymatous, 20 to 35 μ thick, the covering layer of dark pseudoparenchyma 28 to 34 μ, and the hymenium 100 to 110 μ. The broad, somewhat fusiform asci, truncate to rounded at the tip, measure 87 to 102 by 18 to 24 μ and are occupied by eight clavate-fusiform, hyaline ascospores, tapering towards the base, 36 to 56 by 3·5 to 5 μ, surrounded by a conspicuous gelatinous sheath up to 8 μ thick; the simple, filiform, membranaceous paraphyses measure 100 to 110 by 1 μ. The new species most closely resembles *H. laricis*, the type species of the genus [*R.A.M.*, xii, p. 255], but the

pycnidia and pycnospores so profusely formed by the latter are not known to occur in *H. hiratsukae*.

LAGERBERG (T.). **Barrträdens vattved.** [Wet wood of conifers.]—*Svenska SkogsvFören. Tidskr.*, xxxiii, 2, pp. 177–264, 1 pl., 32 figs., 1935. [English summary.]

A characteristic defect of Swedish conifer (pine and spruce) wood is fully described from the morphological, anatomical, silvicultural, and economic standpoints, the mycological aspects of the trouble, known as 'wet wood' and stated to be on the increase, being less exhaustively treated. The present account is based on observations made in 1933 in the affected stands of southern Lapland, supplemented by extensive laboratory studies. In Sweden the disturbance has been found to occur only from upper Dalecarlia northwards; it has been reported also from Norway and northern Finland, where it has, however, attracted little attention.

Two types of wet wood are differentiated, one directly associated with dead branches in the upper part of the trunk and mainly affecting trees upwards of 170 years old, and the other connected with dead roots, occurring below breast-height in younger trees (from 100 years). In the first type the rot assumes the form of streaky infiltrations in the heartwood, which in the second becomes partially or wholly saturated with moisture.

The depreciation in log grading due to wet wood alone was conservatively estimated at 14·6 per cent. The timber also requires a much longer period of seasoning than sound material, and is liable to severe cracking during this process.

Wet wood is not considered to be a true rot. In the branch-borne form of the disease the material has repeatedly been found perfectly sterile, while the Dematiaceae and other fungi associated with wet wood of the roots are obviously soil occupants which penetrate through the cracks and produce a blue-black stain known to lumbermen as 'dark wet wood'. Such changes, however, render the trees accessible to true wood-rotting fungi, mostly confined to the butts and readily removable during logging operations. Cultural studies have shown that *Poria vaporaria*, *Polyporus borealis* [*R.A.M.*, xiii, p. 738], and *P. schweinitzii* are present, but the only organism developing fruiting bodies on transfer to wood is a *Coniophora* closely agreeing with *C. fusispora* (Cooke & Ell.) Cooke described from North America.

DAY (W. R.) & PEACE (T. R.). **Butt rot of conifers.**—*Forestry*, ix, 1, pp. 60–61, 1935.

The authors state that preliminary investigations have established that *Fomes annosus* [*R.A.M.*, xiv, p. 663] is the fungus most commonly found associated with butt rot in conifer plantations in Great Britain, other records including *Stereum sanguinolentum* [ibid., xiv, p. 728], *Polyporus schweinitzii* [ibid., xi, p. 615], *Pholiota squarrosa* [ibid., xiv, p. 677], and *Armillaria mellea* [ibid., xiii, p. 553; xiv, pp. 618, 677]; it is believed, however, that further researches will add considerably to this list. Butt rot occurs on a great variety of soil types, and has been found in serious amounts on soils which superficial examination would

show to be quite suitable for healthy tree growth. So far European larch [*Larix europaea*] appears to be the most commonly affected, and Norway spruce [*Picea excelsa*] to a rather smaller extent, while it appears almost certain that Scots pine [*Pinus sylvestris*] is less susceptible than either of the two first-named species.

NISIKADO (Y.) & YAMAUTI (K.). **Contributions to the knowledge of sap stains of wood in Japan. III. Studies on Ceratostomella piceae Münch, the cause of a blue stain of Pine trees.**—*Ber. Ōhara Inst.*, vi, 4, pp. 539–560, 5 pl., 1935.

Continuing their studies on the species of *Ceratostomella* responsible for blue stain of pine trees in Japan [*R.A.M.*, xiv, p. 275], the authors give a full, tabulated account of their work on *C. piceae*, which attacks a large number of woods, including *Pinus thunbergii*, *P. densiflora*, *P. parvifolia*, *Chamaecyparis obtusa* Sieb. & Zucc. [*Thuja occidentalis* L.], *Picea jezoensis*, *P. glehnii*, *Quercus grandifolia* Blume [*Q. spicata*], *Magnolia hypoleuca* Sieb. & Zucc., *Betula japonica* Sieb. [*B. alba* L.], and *Acer pictum* Thunb. Standing as well as felled pines are liable to infection by *C. piceae*, the wedge-shaped, greyish-blue discoloration of the sapwood being generally much lighter than that due to *C. pini* or *C. ips* [ibid., xiv, p. 729]. Reports from Saghalien state that standing spruces may also be attacked by *C. piceae*, but in western Japan the fungus is more prevalent in the timber yards.

Strains of the fungus from pine, birch, and other woods were grown on a number of standard media. The hyphae, 3 to 8, commonly 5 μ in diameter, penetrate the parenchyma cells of the medullary rays from the cortex towards the centre, while the resin ducts and tracheids are invaded in a longitudinal and the bordered pits in a tangential direction. *C. piceae* produces three conidial stages [ibid., xiv, pp. 271, 274]: (1) a *Graphium* stage on the surface of the stained sapwood and in culture; (2) a *Cephalosporium* stage, generally formed in culture and sometimes on germ-tubes of ascospores, with elliptical or long elliptical spores with rounded ends; and (3) a *Cladosporium* stage, produced on protuberances at the end of conidial and ascosporal germ-tubes and in culture, with colourless, spindle-shaped, or elliptical spores, straight or rarely curved, with one or both ends pointed, the conidial dimensions of the three types being 3 to 8 by 2 to 4 μ (mean $4{\cdot}82 \pm 0{\cdot}03$ by $2{\cdot}50 \pm 0{\cdot}03$ μ), 4 to 12 by 2 to 4 μ ($7{\cdot}17 \pm 0{\cdot}06$ by $2{\cdot}88 \pm 0{\cdot}02$ μ), and 4 to 22 by 2 to 4 μ ($9{\cdot}13 \pm 0{\cdot}10$ by $2{\cdot}90 \pm 0{\cdot}02$ μ), respectively. On germinating the conidia swell and assume a spherical, elliptical, or long-elliptical shape, the dimensions at this stage being 6 to 15 by 5 μ. The flask- to bulb-shaped perithecia are produced profusely on the cut surface of timber; those formed in culture on steamed pine blocks measure 105 to 225 by 105 to 225 μ ($157{\cdot}1 \pm 2{\cdot}34$ by $161{\cdot}2 \pm 2{\cdot}69$ μ) and are furnished with straight or slightly curved beaks, dark brown at the base, becoming lighter towards the apex, 650 to 1,950 μ ($1{,}247 \pm 17{\cdot}06$ μ) long by 5 to 55 μ ($26{\cdot}3 \pm 0{\cdot}06$ μ) at the base and 3 to 18 μ ($9{\cdot}6 \pm 0{\cdot}05$ μ) near the tip, where they are fringed with 10 to 15 hyaline cilia, 20 to 30, rarely 40 μ in length. The spherical or short-elliptical asci, 4·5 to 10·5 μ in diameter, contain eight hyaline, reniform or long-elliptical, straight or curved ascospores, 2·8 to 4·8 by 0·8 to 2·3 μ ($3{\cdot}7 \pm 0{\cdot}041$ by $1{\cdot}4 \pm 0{\cdot}026$ μ),

becoming globular on germination (5 to 8 by 4 to 5 μ) and producing one or two germ-tubes, over 6 μ thick.

The growth-rate of *Ceratostomella piceae* in culture at 25° C. was found to be much slower than that of *C. pini* and *C. ips*. Neither vegetative growth nor conidial germination takes place in the absence of free oxygen. The conidia and ascospores succumbed to 10 minutes' immersion in water at 52° or 15 at 50°, and were also destroyed by one hour's treatment in 1 in 4,000 mercuric chloride or 1 in 200 formalin and uspulun. Growth was inhibited by the incorporation with malt extract agar of mercuric chloride or uspulun at a strength of 1 in 10,000 or copper sulphate at 1 in 5,000.

Baxter (D. V.). **Some resupinate Polypores from the region of the Great Lakes. VI.**—*Pap. Mich. Acad. Sci.*, xx, pp. 273–281, 6 pl., 1935.

Continuing his studies on the resupinate Polypores of the Great Lakes [*R.A.M.*, xii, p. 543], the writer discusses the pathogenicity, distribution, taxonomy, and hosts of *Poria subacida* [ibid., xi, p. 552] with special reference to its occurrence on white cedar (*Thuja occidentalis*). The type of decay induced on various hosts is a spongy rot, accompanied in the early stages by numerous black spots, which become surrounded by a whitened area and finally disappear. The pale areas expand and the wood surrounding the spots turns straw-coloured. Ultimately the white cavities coalesce and convert the heartwood into a soft, spongy mass of water-soaked fibres. Features similar to the foregoing characterize the 'feather butt rot' of balsam fir (*Abies balsamea*), reported by McCallum from Canada as probably due to the same organism [ibid., viii, p. 412]. The average loss in weight of white cedar wood from the decay caused by *P. subacida* was estimated in cultural tests as 3·54 per cent. of the oven-dry weight in a year. A list is given of 39 different trees liable to attack by *P. subacida*, including sugar maple (*Acer saccharum*), birch (*Betula alba* var. *papyrifera*, *B. lenta*, and *B. lutea*), chestnut, ash, walnut, larch, *Pinus strobus* and eight other species, plane (*Platanus occidentalis*), *Pseudotsuga taxifolia*, oak (*Quercus alba* and *Q. borealis* var. *maxima*), and lime (*Tilia americana*). The fungus commonly produces fruiting bodies on *Thuja plicata* but never, so far as known, on *T. occidentalis*. The latter is affected by a similar rot of white cedar which is common in certain areas and is associated with a sterile fungus probably identical with *P. subacida*.

Armstrong (F. H.). **Further tests on the effect of progressive decay by Trametes serialis Fr. on the mechanical strength of the wood of Sitka Spruce.**—*Forestry*, ix, 1, pp. 62–64, 1 pl., 1 graph, 1935.

The experiments briefly reported in this note showed that the reduction in compressive strength (parallel to the grain) of Sitka spruce [*Picea sitchensis*] wood stands in close relationship to the advance of decay caused by *Trametes serialis* [*R.A.M.*, xi, p. 342] as evidenced by loss in dry weight. The progress of the decay was marked by a very much more brittle and irregular type of fracture. The results of the investigation are in close agreement with those of the previous static bending tests [loc. cit.].

Inoue (Y.). **On some physiological characters of Stereum induratum Berk.**—*Ann. phytopath. Soc. Japan*, v, 1, pp. 1–9, 1935. [Japanese, with English summary.]

When *Stereum induratum* [*R.A.M.*, xiii, p. 135] was cultured on sixteen different media the aerial mycelium (which was almost yellow) grew best on apricot media (decoction and agar). The optimum, minimum, and maximum growth temperatures were, respectively, from 24° to 32°, a little above 4°, and between 36° and 40° C. The fungus was ascertained by Bavendamm's method to belong to the lignin-dissolving group, and to grow best in cultures containing 0·05 to 0·1 per cent. tannic or gallic acid [ibid., viii, p. 281].

Cummins (J. E.). **Tests of the efficacy of the oxy-acetylene scouring and charring process for sterilising partly decayed poles.**—*Pamphl. Coun. sci. industr. Res. Aust.* 57 (*Tech. Pap. Div. For. Prod.* 18), 43 pp., 8 figs., 1935.

A full, tabulated account, preceded by a foreword by I. H. Boas, Chief, Division of Forest Products, Commonwealth Council of Scientific and Industrial Research, is given of laboratory experiments on the new oxy-acetylene scouring and charring process, initially developed by Messrs. Allen-Liversidge (Australia), Ltd., for the treatment of partly decayed standing poles. Based on the outcome of the experimental work (in which *Eucalyptus* poles were used), the following procedure is recommended. The earth or other filling round the poles to a depth of 12 or 18 in., or to the limit of visible external decay, is removed, followed by the trimming off of any sapwood or badly mottled areas for some 30 in. above and 12 in. below ground. After ascertaining by means of a specially designed tool the exact extent of the rot and burning in the hole the chips trimmed off the pole, the prepared portion of the latter is exposed to the action of an oxy-acetylene torch, the pointed flame of which is applied to a crack or decay pocket. An area 18 in. above and from 12 to 18 in. below ground is then charred, applying the torch (with a specially constructed tip designed to give a broad, even flame) vertically and continuing until a charcoal layer about $\frac{1}{16}$ to $\frac{1}{8}$ in. is obtained. Warm or cold creosote oil is next applied under pressure to the pole in the form of a fine, cone-shaped spray commencing at the base and working up to the top of the area to be treated. At least four sprayings should be given at three-minute intervals. When the soil is being returned to the hole, about $\frac{1}{2}$ to 1 gall. creosote should be puddled into it immediately round the pole. A superior creosote should be used, conforming to draft Australian Standard Specification K 55.

Frosch (C. J.). **Chemical studies of wood preservation. V. The correlation of distillation range with the viscosity of creosote. VI. The correlation of the distillation range with the surface tension of creosote. VII. The correlation of distillation range with the interfacial tension of creosote against water.**—*Physics*, vi, 5, pp. 165–177, 5 graphs, 1935.

Viscosity being an important factor influencing the penetration, retention, permanence, and 'bleeding' of the creosotes used in wood

preservation [*R.A.M.*, vii, p. 69; xiii, p. 203], a study was made at the Bell Telephone Laboratories of the viscosity measurements of eight creosotes distilled from one tar but of various boiling ranges. All were found to be truly viscous solutions, their viscosity values being independent of pressure when observed at constant temperature. The viscosity data obtained indicated that the material boiling below 355° C. may be regarded as solvent and the residue above that temperature as solute.

The surface tensions of the eight creosotes used in these experiments were not found to differ appreciably at various temperatures (40°, 60°, 80°, and 100°). Differences in the rates of penetration of such creosotes into capillary materials are regarded as due to variations in the viscosities or the solid-liquid contact angles.

The interfacial tension values against water of the experimental creosotes were found to vary by as much as 30 per cent., although no definite trend was present that could be related to other physical properties. Two hypotheses which might account for these disparities are advanced and briefly discussed.

WALKER (J. C.) & LARSON (R. H.). **Calcium cyanamide in relation to control of clubroot of Cabbage.**—*J. agric. Res.*, li, 2, pp. 183–189, 1935.

The results [which are tabulated] of experiments carried out in continuation of the authors' studies on the control of club root of cabbage (*Plasmodiophora brassicae*) [*R.A.M.*, xiii, p. 669] showed that in greenhouse tests calcium cyanamide [ibid., xiv, p. 151] at the rate of 250 lb. per acre prevented infection of the cabbage seedlings in club root-infected soil having a reaction of P_H 6·4, while a dressing of calcium hydrate at the rate of 525 lb. per acre was required to accomplish the same effect. Evidence indicated that the toxicity of the former substance to the parasite is due not only to the basic compounds formed from it, but also to the CN_2 anions in the soil solution before hydrolysis of the calcium cyanamide is complete. The doses required for effective field control were much higher, as was the case also with calcium hydrate, the results in both series of experiments indicating that calcium cyanamide is roughly about twice as effective, pound per pound, as calcium hydrate. It is suggested that in soils the acidity of which needs to be corrected to reduce club root, calcium cyanamide can be used in doses sufficient to satisfy the requirement in available nitrogen, and in cases where these doses are not sufficient to neutralize the soil acidity calcium hydrate should be used to supplement the cyanamide.

WHITEHEAD (T.). **The effects of varying the distance to which Swedes are singled.**—*Welsh J. Agric.*, xi, pp. 228–235, 1935.

The trials reported in this paper were made in 1933 and 1934 at Bangor, Wales, in view of the evidence obtained by some New Zealand workers that the damage done to swedes by dry rot (*Phoma lingam*) may be minimized by close spacing of the roots [*R.A.M.*, ix, p. 151]. The results showed that, besides its influence on dry rot which only occurred on the most widely spaced plants (0·25 per cent. affected), closer spacing also tended to reduce the incidence of bacterial crown rot

caused by a strain of *Bacillus carotovorus* [ibid., xii, p. 546], and perhaps also bacterial root rot caused by another strain of this organism. On the other hand, it had no influence on the incidence of mildew (*Erysiphe polygoni*) [ibid., xiii, p. 76] and almost certainly none on club root [*Plasmodiophora brassicae*], and tended to favour the spread of leaf spot (*Cercospora* sp.), a disease which is stated to be of less importance than the others. It was also shown to increase the fresh weight yield of the crop by at least a ton per acre, and also to increase the feeding value of the roots.

Gerlach (M.). **Die Bekämpfung der Herz- und Trockenfäule der Rüben durch borhaltige Superphosphate.** [The control of heart and dry rot of Beets by boron-containing superphosphates.]—*Superphosphat, Berl.*, xi, p. 26, 1935. [Abs. in *Chem. Zbl.*, cvi (ii), p. 1425, 1935.]

Two new fertilizers have been developed for the control of heart and dry rot of beets in Germany [*R.A.M.*, xiv, p. 733], namely, a boron-superphosphate with 5 per cent. borax and 17 to 18 per cent. water-soluble phosphorous pentoxide, and Bor-Am-Sup-Ka [ibid., xiv, p. 613], containing 2·5 per cent. borax, 6 per cent. ammonia nitrogen, 8 per cent. phosphorous pentoxide, and 12 per cent. potash, the former to be applied at the rate of 4 to 5 and the latter at 8 to 10 doppelzentner per hect.

Decoux (L.), Roland (G.), & Simon (M.). **La pourriture du cœur de la Betterave en Belgique en 1934.** [Heart rot of the Beet in Belgium in 1934.]—*Publ. Inst. belge Amélior. Better.*, iii, 4, pp. 195–206, 3 figs., 1935. [Flemish, German, and English summaries.]

Exceptionally severe damage is stated to have been caused in Belgium in 1934 by heart and dry rot of sugar beets [*R.A.M.*, xiii, p. 348], which occasioned appreciable losses both among farmers and manufacturers. The disease has hitherto occurred only in a sporadic form in the country, and the recent outbreak is attributed to the coincidence of excessive drought, light soil, and high alkalinity of the latter (P_H 7·35 and 8·4). A summary is given of experiments conducted in other countries on the control of the disease by the application of boron to the soil [see preceding abstract].

Schmidt (E. W.). **Zur pathologischen Physiologie albicater und mosaikkranker Zuckerrübenblätter.** [On the pathological physiology of albicant and mosaic-diseased Sugar Beet leaves.]—*Phytopath. Z.*, viii, 4, pp. 363–368, 1935.

Further observations and experiments at the Klein-Wanzleben Sugar Factory, Germany, on 'albinism' of sugar beet leaves, an hereditary anomaly expressed by partial or total whitening of the surface, showed that pathological modifications in assimilation, nitrate and albumin metabolism, transpiration, and respiration are associated with the disturbance. Similar but less extensive changes were found to characterize the diseased portions of mosaic foliage [*R.A.M.*, vii, p. 355].

McDonald (I. M.). **Tests of curly-top resistant Beets.**—*Facts ab. Sug.*, xxv, 6, pp. 212–214, 1 fig., 1935.

In 1933 and 1934 the Holly Sugar Corporation, co-operating with growers in western Colorado, made a number of comparative test plantings with the U.S. No. 1 curly-top resistant strain of sugar beet [*R.A.M.*, xiv, p. 488] and selected European types. In 1934 the disease assumed a much more virulent form than in the foregoing year, and by mid-July the average amount of curly top in test plantings in the Delta district was 90·7 per cent. for the European varieties and 71·4 for U.S. No. 1, while at the end of the season the proportion of European plants showing severe injury was about double that recorded for U.S. No. 1. In 19 out of the total of 25 test plantings made in 1933 the yield of U.S. No. 1 exceeded that of the European varieties, the greatest difference in favour of the former being 5·65 tons per acre. In 1934 U.S. No. 1 outyielded the European strains in every case by 1·16 to 8·07 tons per acre. In only five out of the total of 39 test plantings made over the two-year period did the European varieties outyield U.S. No. 1 by a maximum of 1·75 tons per acre, and in all these fields curly top was relatively insignificant. The increased yield from U.S. No. 1 seed used in the Grand Valley in 1934 is estimated at 2,828 tons of beets from 1,414 acres and in the Delta district at 8,160 tons of beets from 2,245 acres.

Hughes (W.). **Investigations on the control of seedling diseases of Sugar Beet.**—*Sci. Proc. R. Dublin Soc.*, N.S., xxi, No. 22, pp. 205–212, 1935.

Sugar beet seed used in the Irish Free State is usually imported from the Continent, and the author gives a brief tabulated account of experiments in 1934 at Glasnevin, Dublin, in which the efficacy of seed treatment with ceresan prior to shipment, for the control of blackleg (*Phoma betae*, *Pythium de Baryanum*, and *Rhizoctonia* [*Corticium*] *solani*) [*R.A.M.*, xiv, p. 548] was compared with treatment with one liquid (germisan) and seven proprietary dust preparations in small lots just before sowing. Preliminary tests indicated that the seed used (Kühn P) contained 12 per cent. of seed-clusters visibly affected with *P. betae* [cf. ibid., xiii, p. 742], and that none of the treatments applied stimulated or increased germination of the seed, while the pre-shipment bulk treatment significantly reduced it, presumably owing to too long contact between the seed and disinfectant.

In randomized field experiments, the results of which were statistically analysed, germisan and ceresan (U.T. 1875 A) increased the number of resulting seedlings by 27·6, granosan [ibid., xiii, p. 488] by 25·6, and ceresan (old) by 21·7 per cent. over the control, while the remaining treatments, including the pre-shipment one, were not significantly better than the control. The increase in the number of seedlings is attributed to the controlling effect of the preparations on *P. betae*, mainly in preventing it from killing the seedlings before their emergence above the soil.

While blackleg did not appreciably affect the number of the sugar beets after singling in the field or the yield, seed treatment is considered

necessary owing to the moist conditions which usually prevail in Ireland during late spring and are conducive to the development of the disease.

Orton (C. R.) & Henry (W. D.). **An internal necrosis of Bean seeds.**—*Phytopathology*, xxv, 7, pp. 726–727, 1 fig., 1935.

An apparently new disorder has been observed affecting Wooster Mammoth and Jarvis bean [*Phaseolus vulgaris*] pods in West Virginia, the former variety being the more susceptible, with 47 out of 49 pods diseased compared with 10 out of 51. The seeds (one or more in each pod) showed pale yellow to dark brown, necrotic spots of very variable diameter in the centre of the flat inner surface of both cotyledons. No external symptoms of decay were detected. Attempts to isolate a causal organism from the necrotic pods were unsuccessful, and the disturbance would appear to be of a non-parasitic nature like the similar 'marsh spot' of peas [in England and Holland: *R.A.M.*, xiv, p. 279] and the internal spotting of western peas reported by Zaumeyer and Wade from Virginia [ibid., xiv, p. 341].

Mahoney (C. H.). **Breeding Snap Beans for mosaic resistance. A progress report.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 483–484, 1934.

During the past four years numerous selections from commercial varieties and crosses of snap beans [*Phaseolus vulgaris*] have been tested in the field at the Michigan Agricultural Experiment Station for resistance to common mosaic (virus 1) [*R.A.M.*, xiv, p. 148]. So far only three F_8 progenies out of 22 from a cross of Wells Red Kidney × Refugee Wax showed over 10 per cent. infection, while eight were entirely free from disease; the average mosaic percentage of nine Stringless Green Refugee controls was 34·4. The above-mentioned family crossed on Green Refugee yielded 23 F_4 progenies of which ten showed over 10 and five under 5 per cent. infection. Only two F_8 progenies out of 17 from a 'black-seeded' selection contracted more than 10 per cent. mosaic, most of the lines of this type being very slightly infected (under 5 per cent.) in the field and suffering comparatively little crop reduction. Two Refugee selections were made in 1931 and yielded one progeny with marked resistance.

Tate (H. D.). **Intracellular abnormalities associated with yellow dwarf of Onions.**—*Iowa St. Coll. J. Sci.*, ix, 4, pp. 677–683, 1 pl., 1935.

The tissues of onions affected with yellow dwarf [*R.A.M.*, xiii, p. 146] contained a few very irregularly distributed intracellular bodies commonly resembling, and sometimes indistinguishable from, nuclei (to which they were usually in close proximity), but varying greatly in size, form, and structure. It is thought that they may be of nuclear origin and possibly resulted from amitotic nuclear division. In the tissues of apparently healthy onions multinucleate cells were occasionally found, some of which showed the presence of bodies resembling those seen in the diseased onions. This, if the onions were in fact healthy, would indicate a tendency of onion cells towards the multinucleate condition; while the presence of a virus in the protoplast of the cell

would probably increase the tendency of the nucleus to divide and produce abnormalities in the nuclei.

Böhne (F.). **Ueber Bekämpfung wichtiger Spargelkrankheiten und Spargelschädlinge während des Sommers.** [On the control of important Asparagus diseases and Asparagus pests during the summer.]—*Obst- u. Gemüseb.*, lxxxi, 7, p. 100, 1935.

Since 1928 asparagus rust [*Puccinia asparagi*: *R.A.M.*, xiv, p. 554] is stated to have been a veritable scourge in Germany, appearing in May and June on the young plantings whence it rapidly passes to the older fields. The affected plants shrivel and are unable to absorb the necessary reserves for the next year's crop, which consequently suffers not only in quantity but in quality. The sole reliable method of control consists in the timely destruction of all dead material, more especially on the young plantings, a practice formerly compulsory in Baden, but since fallen into disuse.

Ainsworth (G. C.). **Virus diseases of Cucumber.**—*J. Minist. Agric.*, xlii, 4, pp. 338–344, 2 pl., 1935.

This is an abridged, popular version of the author's recent account of the three virus diseases of cucumbers known to occur in England, namely, green-mottle mosaic (cucumber virus 3), yellow mosaic (cucumber virus 4), and yellow-mottle mosaic (cucumber virus 1) [*R.A.M.*, xiv, p. 554], and of their control.

Bailey (R. M.) & Burgess (I. M.). **Breeding Cucumbers resistant to scab.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 474–476, 1935.

Of 125 lots of cucumber seed tested in 1931–2 for reaction to scab (*Cladosporium cucumerinum*) [*R.A.M.*, xiv, p. 182], a destructive disease in Maine, 117 exhibited no resistance in the seedling stage. Two of the remaining eight lots contracted no infection, while the others showed varying degrees of resistance. None of these, however, belonged to the popular pickling and early-slicing type. Further work on the eight resistant seed lots showed that the two remaining free from scab in the previous tests maintained their resistance on continued selfing. From the limited data available, it appears that a small number of factors, possibly only one, are involved in the inheritance of resistance to the disease.

Mahoney (C. H.). **Seed transmission of mosaic in inbred lines of Muskmelons (Cucumis melo L.)**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 477–480, 1935.

In the spring of 1932 and again in 1933 several cases of mosaic occurred among seedlings grown from various muskmelon inbreds and crosses in Michigan in a form strongly suggestive of seed transmission [*R.A.M.*, xiv, p. 6]. Six out of 48 inbred progenies showed seed-borne mosaic, averaging 24 per cent. infection. Further selections were made from these progenies and in every case where the plant was infected it transmitted mosaic through the seed, the average percentage transmission being 15·6. Besides the inbreds 16 commercial varieties were grown in the field. Seed was saved from healthy and infected plants and grown in the greenhouse in the early autumn. The disease was

transmitted through the seed by all the plants of four lines showing mosaic symptoms at harvest time, the average percentage of infection ranging from 8·9 in line 1487 to 27·1 in line 1490. On the other hand, the three selections free from mosaic at harvest time did not transmit the disease to their progenies, while large healthy crops were also produced by non-infected selections from inbred Honey Rocks and open-pollinated Honey Net.

CURRENCE (T. M.) & LEACH (J. G.). **Progress in developing Muskmelon strains resistant to Fusarium.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 481–482, 1935.

In tests in 1933–4 in Minnesota to develop resistance to *Fusarium* wilt of muskmelons (the agent of which is stated to be allied to, possibly a mutant of, *F. niveum*) [*R.A.M.*, xiv, pp. 349, 419], a certain amount of promise was shown by the Honeydew, Casaba, Persian, and Honey Ball varieties with 35, 34, 43, and 30 per cent. infection, respectively, compared with 96 in Benders Surprise, 93 in Pollock, 89 in Sugar Rock, and 80 in Emerald Gem. Selection 73–33, with 56 per cent. infection, occupies an intermediate position between the resistant and susceptible types. The watermelon wilt due to *F. niveum* does not occur in the districts affected by the muskmelon disease, which does not, moreover, attack Kleckley Sweet watermelons, so that the origin of the severe epidemic in 1932 is obscure. According to a recent report, the same or a similar disorder occurs near Rochester, New York.

PRICE (W. C.). **Acquired immunity from Cucumber mosaic in Zinnia.**—*Phytopathology*, xxv, 8, pp. 776–789, 4 figs., 1935.

Ordinary (Porter's) cucumber mosaic and three other strains of the virus known, respectively, as 1, 2, and 9 (formerly cucumber virus Y) produce clearing of the veins and mottling of varying intensity in *Zinnia elegans* leaves, whereas strain 6 [*R.A.M.*, xiv, pp. 5, 782] causes the formation of bright yellow, later brown, necrotic lesions, sometimes involving the entire leaf and often extending down the petiole into the stem, killing the plant. *Z. elegans* plants inoculated with ordinary tobacco mosaic generally show no signs of primary infection, though small, chlorotic lesions may appear in three to five days, while vein-clearing has occasionally been observed a little later. The most prominent symptom, however, is a light and dark green foliar mottling, especially in the leaves just below the tip. Infected plants usually show extensive stunting. Tobacco aucuba mosaic produces in *Z. elegans* a mottling pattern composed of intermingled yellow areas on a dark green background, frequently accompanied by pale to vivid yellow zonate ring designs. A necrotic type of tobacco mosaic virus isolated from one of Jensen's yellow mosaic strains [ibid., xiii, p. 329] produces large necrotic primary lesions on *Z. elegans* leaves, while tobacco ring spot [ibid., xiv, p. 659] causes temporary vein-clearing and leaf rolling or curling and mild mottling. Similar but rather more severe symptoms are produced by Valleau's yellow tobacco ring spot virus [ibid., xii, p. 471]. Transferred to *Z. elegans*, severe etch [ibid., xiv, p. 782] produces persistent vein-clearing and distortion (without mottling) of the foliage and severe stunting of the plants.

Z. elegans plants contracting infection by any one of the four strains of cucumber mosaic mentioned above acquired immunity from the necrotic type (strain 6) of the same virus but not from the necrotic type of tobacco mosaic. Conversely, plants developing mottling by the tobacco or aucuba mosaic viruses acquire immunity from the necrotic type of tobacco mosaic but not from the necrotic cucumber mosaic strain 6. On the other hand, plants infected by tobacco ring spot, yellow ring spot, or severe etch acquire no immunity from the necrotic types either of cucumber or tobacco mosaic. The results of these experiments are considered to afford evidence of the specificity of the immune reaction in *Z. elegans* for both the cucumber and tobacco mosaic viruses.

Esau (Katherine). **Initial localization and subsequent spread of curly-top symptoms in the Sugar Beet.**—*Hilgardia*, ix, 8, pp. 397–431, 4 pl., 7 figs., 1935.

Continuing her investigations of the curly-top disease of sugar beets [*R.A.M.*, xiv, p. 487], the author gives details of her anatomical studies of healthy and diseased beet plants, the results of which showed that both external and internal pathological symptoms appear in young leaves that are closely and intimately connected by phloem tissue with the inoculated leaf, and that in the fleshy tap-root phloem degeneration first sets in on the side from which the inoculated leaf diverges; later the degeneration, which at first is strictly localized, spreads laterally in each ring, and from the older to the newly developing rings. Both in the leaves and in the tap-root, phloem degeneration is initiated near the first-formed sieve-tubes, before the mature xylem and protoxylem, respectively, are differentiated. Bodies interpreted as intracellular inclusions occur commonly adjacent to the first sieve-tubes, from which the virus seems to spread in the phloem, and less frequently in cells farther away from these sieve-tubes. These inclusions eventually disappear from those cells containing them which are not necrosed, and which usually develop into elements having all the characteristics of sieve-tubes.

These results are considered to support the view that curly-top virus is translocated in the phloem tissue, in particular in the mature sieve-tubes [loc. cit.; cf. also ibid., xiii, p. 674].

Redlich (H.). **Résultats des essais effectués à la sucrerie de Enns pour lutter contre la cercosporiose de la Betterave (Cercospora beticola Sacc.) en 1934.** [The results of experiments carried out at the Enns sugar factory to combat the cercosporiosis of the Beetroot (*Cercospora beticola* Sacc.) in 1934.]—*Publ. Inst. belge Amélior. Better.*, iii, 5, pp. 275–293, 17 graphs, 1935. [Flemish, German, and English summaries.]

Almost without exception the yield of foliage, root weight, and sugar content of beets treated with Bordeaux mixture or copper sulphate dust at Enns, Upper Austria, in 1934 against *Cercospora beticola* [*R.A.M.*, xiii, pp. 316, 348; xiv, p. 548] were higher than the corresponding values for untreated material. Under local conditions it is inadvisable to commence the treatments before mid-June. In most of the tests, Bordeaux mixture proved more reliable than copper sulphate dust, six applications of the latter at 10 per cent. being required to

produce effects comparable to those given by four treatments with the former at 2 per cent. Little difference was observed between the efficacy of the 1, 1·5, and 2 per cent. concentrations of Bordeaux mixture, but a strength of 0·5 per cent. was definitely inadequate, while above 2 per cent. the cost is too high to be lucrative. A concentration of 5 per cent. was too low for the copper sulphate dust, 10 per cent. being the minimum at which satisfactory results can be anticipated. Thoroughness of application of the disinfectants was found to be quite as important as the correct timing of the treatments. Hence better results were obtained in the series of tests conducted by scientific experts than in those made in the field by the growers, although the outcome in this case also was sufficiently encouraging. Even without treatment, some [unnamed] varieties for which selection firms claim resistance to *C. beticola* yielded better than the ordinary sorts. Conversely, however, some non-resistant varieties gave higher yields than the reputedly resistant strains under the same treatment.

QUINN (D. G.). **Causes of the short Victorian vintage for 1935. Black spot and other factors.**—*J. Dept Agric. Vict.*, xxxiii, 8, pp. 397–399, 403, 2 figs., 1935.

The heavy autumn and winter rainfall in Victoria in 1934–5 is considered to have predisposed the vines to infection by *Manginia ampelina* [*Gloeosporium ampelophagum*: *R.A.M.*, xiv, p. 616], a major factor in the poor vintage of 1935. A popular note is given on the life-history of the fungus, which under local conditions affects chiefly the Sultana, Muscats, Grenache, Doradillo, Rhine Riesling, Malbec, and Carignane varieties, as well as the drying and large-fruited table sorts, and on its control by the application of a late dormant spray of iron sulphate (20 lb.) and sulphuric acid (8 lb.) in 10 galls. water at the rate of 15 to 20 galls. per acre. A 10 per cent. solution of sulphuric acid is also reported to have given good results. Just as the buds are bursting the vines should be treated with strong Bordeaux mixture (5–5–10) plus casein followed by another Bordeaux spraying when the shoots are 6 to 8 in. long. Later treatment against downy mildew [*Plasmopara viticola*] should also prove efficacious against *G. ampelophagum*.

BOSC (M.). **Bouillies cupriques au sulfate d'ammoniaque.** [Cupric mixtures with ammonium sulphate.]—*Progr. agric. vitic.*, ciii, 24, pp. 562–566, 1935.

The author states that very satisfactory results were obtained by French vinegrowers in 1934 by the use of ammonium sulphate [*R.A.M.*, xiv, p. 75] with cupric sprays in the control of vine mildew [*Plasmopara viticola*]. In the light of further experiments the author considers that the amount of ammonium sulphate may be advantageously reduced, excellent control having been obtained in 1934 and 1935 by the following formula: copper sulphate 3 kg., lime 2·5 to 3 kg., ammonium sulphate 0·5 to 0·8 kg., in 100 l. water.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, ix, 7, p. 159, 1935.

FRANCE. By a Law of 10th March, 1935, modifying those of 4th August, 1903 and 18th April, 1922, failure to acquaint the purchaser of

a copper fungicide, raw material, or mixture with the copper content per 100 kg. of the preparation is made a punishable offence. The information is to be conveyed on the bill, invoice, packing material, advertisements, and other literature relating to the product concerned. Similar provisions are made in respect of the active elements comprised in any insecticides, fungicides, or other crop pest control materials.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, vii, 7, pp. 104–118, 1935.

GERMANY. Regulation No. 8, dated 20th June, 1935, of the General Association of the German Potato Trade defines the conditions, based on the requirements of the Reich Food Board, for internal and external commerce in table and seed (certified and uncertified) potatoes, including the limits of tolerance for certain diseases of the former. The plant protection authorities should be notified immediately by telephone of the detection of wart disease [*Synchytrium endobioticum*] in a consignment, the disposal of which will be officially arranged. In such cases the consignee is entitled to reject all liability for the goods.

Order by the Governor under section 2 of the Protection from disease (plants) Law 1925 (Law 10 of 1925) prohibiting the removal of any Banana suckers or Plantain suckers except under the conditions stated therein. The Protection from Plant Disease (Banana and Plantain Suckers) Order, 1935.—*J. Jamaica agric. Soc.*, xxxix, 6–7, p. 406, 1935.

The Protection from Plant Disease (Banana and Plantain Suckers) Order, 1935 (Jamaica), superseding that of 1925 [*R.A.M.*, v, p. 63] prohibits the removal, except with an official permit, of banana and plantain suckers outside the boundaries of any one estate or two adjoining estates owned or rented by the same person or company.

Plant Diseases Act, 1924.—Reprinted from *Govt. Gaz., Sydney*, 128, 2 pp., 1935.

By a Proclamation, dated 9th July, 1935, of the Governor of the State of New South Wales and its Dependencies in the Commonwealth of Australia, wheat rust (*Puccinia graminis*) is declared to be a disease within the meaning of the Plant Diseases Act, 1924. By a second Proclamation of the same date, every owner and occupier of land throughout the State is required to destroy all barberry plants growing on such land in order to prevent the spread of the said disease.

United States Department of Agriculture. Bureau of Plant Quarantine. Service and regulatory announcements. Lists of intercepted plant pests, 1934 (list of pests recorded during the period July 1, 1933, to June 30, 1934, inclusive, as intercepted in, on, or with plants and plant products entering United States Territory).—84 pp., 1935.

Among other interceptions made by officials of the plant quarantine and control administration of the United States Department of Agriculture during the period from 1st July, 1933 to 30th June, 1934 [cf. *R.A.M.*, xi, p. 544], the following may be mentioned: *Elsinoe piri* [ibid., xiii, p. 76] on apple from Switzerland; *Entomosporium maculatum*

[*Fabraea maculata*: see above, p. 771] on *Raphiolepis delacouri* from the Argentine; *Physalospora eucalyptina* on *Eucalyptus* sp. from Mexico; *Septoria citri* on citrus fruits from Australia, Egypt, France, Greece, Italy [cf. ibid., ix, p. 303; xii, p. 746], and Spain; *S. pittospori* on *Pittosporum* sp. from Scotland; *Sphaceloma fawcettii* var. *viscosa* on orange from Brazil; and *Phomopsis* sp. on loquat from Italy [cf. ibid., vii, p. 744].

United States Department of Agriculture. Bureau of Plant Quarantine. Fruit and vegetable quarantine. Amendment No. 6 of regulations supplemental to notice of quarantine No. 56.—2 pp., 1935.

As from 1st August, 1935, properly dried, cured, or processed fruits and vegetables, including dried products, cured figs, dates, raisins, etc., nuts and dry beans, peas, etc., may be imported into the United States without special permit or other restriction. Except as restricted, as to certain countries and districts, by special quarantines and other orders, the following fruits may be imported from all countries under permit and on compliance with the regulations supplemental to notice of quarantine No. 56 [*R.A.M.*, iii, p. 239]: bananas, pineapples, lemons, and sour limes. European or Vinifera grapes and any vegetable except as restricted above may also be imported at certain authorized ports on the presentation of satisfactory evidence as to their state of health. Upon compliance with these regulations and under such additional safeguards and conditions as may be prescribed in the permits, all fruits from Victoria, South Australia, and Tasmania may be allowed entry at Seattle, Washington, and Portland, Oregon, or elsewhere as indicated in the permits. Subject to official permission fruits other than those mentioned above may be imported through specially designated ports from New Zealand, Argentina, and Chile. In conformity with the regulations under Quarantine No. 28, oranges of the mandarin class, including Satsuma [*Citrus nobilis* var. *unshiu*] and tangerine varieties, may be imported from Japan through the port of Seattle or other specified northern ports. The entry of citrus fruits from the West Indies is permitted at New York and elsewhere as designated in the permits. The entry of pineapples from Jamaica is restricted to the port of New York or other prescribed northern ports. Irish potatoes may be imported from Mexico under the conditions of the order of 22nd December, 1913. Fruits and vegetables grown in the Dominion of Canada may be imported into the United States free from any restrictions whatsoever.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, ix, 8, pp. 180, 184, 1935.

ERITREA. By a Decree of the High Commissioner for the East African Colonies, dated 13th April, 1935, the introduction into and transit through Eritrea of plants, parts of plants, and bunches of bananas is prohibited except in the case of bunches from Italian Somaliland.

U.S.S.R. A Verbal Note of the People's Commissary for Foreign Affairs, dated 7th April, 1935, prohibits the importation of citrus fruits (oranges, mandarins, and lemons) by way of the Black Sea ports with a view to the exclusion of pests and diseases.

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